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THE STUDY OF INFORMATION TECHNOLOGY EFFECT ON LEATHER PRODUCTION COMPANIES SUPPLY CHAIN CAPACITIES AND PERFORMANCE IN EASTERN AZERBAIJAN PROVINCE, IRAN

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Abstract:
Today, all organizations are somehow exposed to developments in information technology (IT), and the effects of the information and communication technology (ICT) application in all areas of the supply chain, from relationships with suppliers to production and communication with customers, is obvious. In this survey, we study the effect of the use of information technology tools on the capabilities and performance of supply chain in the look of leather production companies in East Azerbaijan province. In this research, we are going to study supply chain communications systems, electronic data interchange, electronic mail, barcode and radio frequency identification in IT instruments and gadget collection; in field of supply chain capabilities, four aspects including the exchange of information, coordination, integration activities and the responsibility of supply chain; and in relation to performance of the supply chain, two performance variables, including sales and marketing performance and financial performance. The results show that based on the research process model, use of information technology (IT) tools have affected on supply chain capabilities and consequently, supply chain performance is also affected.

Keywords: information technology, supply chain, supply chain capabilities, supply chain performance, multiple cases studies

1. Introduction

Supply chain management is one of the strongest operational paradigms to improve competitive advantages of the manufacturing and service organizations. On current

trends, today organizations are not important, rather create value-added in supply chain and its management are main issues. On the other hand, with increasing globalization and international competition and emergence new technologies such as IT, many other policies and past experiences do not have necessary efficient (6). We can say that today almost all organization enterprise to IT developments and the effects of using ICT in all areas of the exhibition chain, from supplier relationships to production and communication with customers, are clear. The use of information technology, whether or not, has influences to improve supply chain management (1). After the introduction, Problem Statement and literature review and then, research method is explained; so, data analysis is expressed and finally, the last part of article is conclusion and recommendation.

1.1 Problem Statement

In this survey, we study the effect of the use of information technology tools on the capabilities and performance of supply chain in the look of leather production companies in East Azerbaijan province. In IT instruments and gadget collection that are used in supply chain management, we can refer to supply chain communication systems, electronic data interchange, electronic mail, barcode and radio frequency identification. Supply chain capabilities point out to an organization's ability to identify and exploit of internal and external resources to facilitate the integration of supply chain activities. These capabilities include four dimensions: exchange of information, coordination, integration activities and supply chain responsibility. In this study, the potential of supply chain, play an intermediate role between investments in IT and supply chain performance. In the field of supply chain performance, two variables of function, including sales and marketing performance and financial performance are examined (19). It is necessary to point out that in this study, we have choose people in the supply chain who look at subject in view of companies, as well as raw material suppliers and customers. These people are generally personnel of leather production companies, who are working in the information technology, sales and marketing units. Also, they have been chosen selectively and purposive.

2. Literature Review

2.1 Supply Chain Management

Supply chain includes all activities associated with the process and exchange of goods and services, from the raw material stage to the final product which is consumed by customers. These transfer in addition to the process material, include information and financial process as well (5). In general, the loop of supply chain on the one hand, is

related to suppliers of raw materials and, on the other hand is in relation to customers(7). Components of a linear supply chain are as follows: 1) up-level supply chain, 2) internal supply chain, and 3) low-level supply chain (3). In other words, according to Christopher, supply chain is a network of up-level to low-level organizations that are included in processes and activities which in the form of goods and services, serve final customers and create value. This definition emphasizes on the need to consider the satisfaction of customers in all supply chain activities (5). So the main purpose of activities which are related to the supply chain is to satisfy customer demand in order to provide a desired product with the highest quality, lowest price and on time delivery to customers (6). Supply chain management is considered from the early 1980s (14). Supply chain management has started from resources which provide the raw materials and continues to use the product by final customers (13). In other words, supply chain management can be described as a way to create value from the primary manufacturer to final customer, including logistics services (activities related to the production and distribution) and transport that joins them to each other (12). In order to improve the process of control and also, improving goods and information management in supply nets, managers have introduced the term supply chain management system. Supply chain management system includes any software that is used for strengthening and coordinating activities in supply nets (such as logistics software). (11)

2.2 Information Technology (IT)

Since the competition began to increase and the supply-based market (present) replaced through market-based consumer (client), the companies were forced to improve supply chain management in order to stay further in the market. At the same time, the companies began the use of computer systems to manage the supply chain. In this regard, while enterprise resource planning techniques were widely accepted by companies in the 1990s, the web-based technologies were introduced in this decade and the companies realized the immense potential of these technologies (14). IT is a revolution which aims to create the basis for e-supply chain. Intelligent use of information technology, enables exchanging information in the Internet, prevents the entry of redundant information, provides required information whenever you need it, permits managers to receive and track complex information more effectively and also, exchange information among the members of the supply chain easier, so provider-customer communications would widely improve (14).

2.3 Supply Chain and Information Technology Relationship

Todays the use of IT is considered as a necessary condition for effective control of complex supply chain (14). A supply chain that has fully integrated with IT system is a chain where in that almost all important organizational business communications with suppliers and customers are digitally enabled or disabled (14). In today's world, e-commerce is proposed as one of the actual manifestations use of ICT. Numerous benefits of using e-commerce were so interesting for all interests that some companies have chosen e-commerce strategy as their competitive strategy (2). We can say that e-commerce and the Internet have changed the nature of supply chains fundamentally and give a new meaning to the manner of consumer awareness about goods, selection, purchase and the use of goods and services. In fact, new generation with the advent of information technology and new business environment, has led to the creation of electronic supply chain, and Unlike traditional kind that was customer-based, the focus of electronic supply chains is on the product(4). Functional roles of IT in supply chain management are as follows:

1. Exchanges perform: The most obvious role of IT in supply chain management is resistance reducing in transactions between supply chain partners through effective information process (14). Can be said that the use of IT in supply chain will improve chain efficiency by reducing uncertainty that caused by the unavailability, incomplete and distorted information (15).

2. Cooperation and coordination: through sharing of information, IT plays an important role in strengthening cooperation and coordination in the supply chain.

3. Decision Support: IT supports decision-making process in the supply chain. In the case, potency of computer analysis can be used to help making management decisions (14). At the end of this section, we will refer to the information technologies that are used in the management processes of demands which are as follows: 1- the aspect of internal supply of information technology; 2- the aspect of external supply of information technology (related to information sharing with suppliers); 3- the aspect of internal demand of information technology (used to plan and forecast demand), 4- the aspect of external demand for information technology (customer). (16)

2.3 Research History

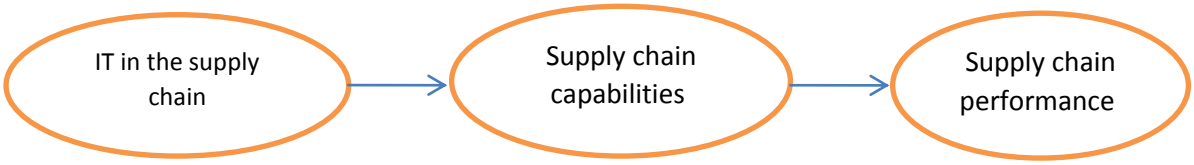
Byrd and Davidson in 2003 examined the impact of information technology on supply chain and business performance. The results showed that three factors including technical quality of IT department, utility of information technology program, senior managers' supporting of information technology have positive and significant influenced on the impact of information technology on supply chain, and in this regard

have a significant and positive relationship with their company's financial performance (9). Finn in a study addressed the effects of company size of the connection between the adoption of information technology and three levels of performance including operational, strategic and financial level. The results show that the size of the company is an important moderator variable in operational efficiency. In other words, with the effective use of information technology in communication with up-level and down-level partners in the supply chain, enterprises can shorten the delay time and thus, the operational efficiency would improve (10). Yu and his colleagues studied the impact of IT on supply chain capabilities and company performance. The results showed that placement of IT in supply chain communications system could lead to better opportunities in areas such as exchange of information, coordination, integration activities and sensitiveness of supply chain (19). Benito studied the relationship between investment in IT and operational efficiency in purchase. Data analysis showed that Investment in IT leaving a positive impact on purchase operational efficiency. Generally, to implement and promote some of the developed purchase activities such as working with suppliers, supplier evaluation, involving suppliers in product development and design, and integration of logistics, information technology adoption in the supply chain is essential (8). Sezen did an empirical survey on relative effects of design, integration and information sharing of supply chain efficiency. Results show that integration and information sharing are safe ways to increase the efficiency of supply chain. Design a supply chain also, has an important role in achieving optimum levels of efficiency (17).

Yvlnjyn and Juraj studied the adoption of information technology in supply chain management. The aim of this study was to measure the use of information technology in the supply chain, as well as the use of the Internet (as a special dimension of information technology. They found that 67.6 percent of the studied companies use information technology in their supply chains. For the majority of companies (53%), the most important reasons to use of information technology in the supply chain, were awareness of customer needs and improve levels of service.18.3% of companies expressed quick access to information and improve the integration of information, and 12.3% of companies also said achieve competitive advantages and sustain them are the main reasons for using information technology in their supply chain. The results show 81.7% of the companies use the Internet and 56.3 percent of companies which using the Internet, have a website. Most companies that have website use it to communicate with customers via e-mail, present sales advertising and public communication activities, as well as show product information, both visually and verbally (18).

2.4 Conceptual Model

Yu and his colleagues in 2006, in a study examine the impact of information technology on supply chain capabilities and company performance. Results showed that the position of IT in supply chain communications system can make better supply chain capabilities in some areas such as exchange of information, coordination, integration activities and sensitivity in supply chain. In addition, they suggest that supply chain capabilities play a moderating role between IT resources and business performance. In other words, improving the supply chain capabilities through information technology can make a direct and positive impact on the performance of marketing and sales (sales growth, market share, product development and market development) as well as on corporate financial performance (profitability, return of investment(ROI) and cash flow). It can be said, using the tools of information technology (IT) has effect on supply chain capabilities and consequently supply chain performance is also affected (19) Based on what was said, the process model used in this study is as follow: (parts of constituent components is reflected in the following model)



IT in the supply chain: supply chain communication systems, electronic data exchange, electronic mail, barcodes, radio frequency identification

Supply chain capabilities: information exchange, coordination, integration of activities, supply chain responsibility

Supply chain performance: 1) marketing and sales functions: sales measurement, market share, product development, market development, response to customer demand, the pursuit of customer orders, providing after-sales service; 2) Financial performance: profitability, ROI, cash flow, cost advantage rather than competitors, demand forecasting, inventory costs, cost and speed of products and services to customers, delay time, the value of equity (19).

3. Research Method

The purpose of this article is functional and in terms of data collection, it is descriptive and multiple cases study. Case studies include a detailed review of one or more organizations or organizational groups that aims to provide an analysis of the case

study context and process. The case is not isolated, but also because of closely relationship, it is studied in connection with the review. Yen believes that the case study is a research strategy and may be a variety of ways is used in it. In current study, the following methods are used: 1) theme analysis, 2) content analysis, 3) inter-case analysis, 4) intra-case analysis.

3.1 Data Analysis

Since this research project is descriptive and explanatory, so no assumption to evaluate it by usual methods of statistical analysis. Hence, to investigate research questions through interviews with experienced experts in the subject in three study items, and according to subject matter and content the results were in categories to first determine what IT tools used, in the second what are the effects of these tools on capabilities and consequently, what are the effects of capabilities on the supply chain.

Interview questions are as follows:

1- Which IT tools is used in your company?
2- What benefits have the use of information technology for your company and supply chain capabilities do what effect have?
3- What effects do supply chain capabilities have on the supply chain, when they use information technology?

So far, most of researches on this particular issue (supply chain and information technology) were carried out with the quantitative vision and methodology, as well the sample size of the articles have often used a lot of statistical and quantitative tools. Due to problems in collecting information on Iran and Iranian organizations as well, according to analyzes level of the company that is considered by this study, a few companies to be investigated in case study, and the results are specific (especially) to these cases. It should be noted that so far in previous research, no one has acted in that way.

3.2 Description of Cases

In this study, three leather manufacturing company in East Azerbaijan province were studied, and in each company two following were interviewed:

- Company A: sales manager and marketing expert;
- Company B: sales manager and marketing expert;
- Company C: IT manager and marketing manager.

Table 1: Code topics derived from analysis of interview data

Components of conceptual model	Code	Literature-based codes	Data research-based codes
Information technology in supply chain	1000	1000	
Supply chain communication system	1100	1100	
Electronic data interchange (EDI)	1200	1200	
E-mail	1300	1300	
Computer software	1400		1400
Internet network	1500		1500
Website	1600		1600
Short messaging system (sms)	1700		1700
Barcoding	1800		1800
Capabilities of supply chain	2000	2000	
Data interchange	2100	2100	
coordination	2200	2200	
Integration of activities	2300	2300	
Responsiveness of supply chain	2400	2400	
Clarify information	2500		2500
Information analysis	2600		2600
Supply chain function	3000	3000	
Marketing and sales function:	3100	3100	
1) Sales amount	3101	3101	
2) Market share	3102	3102	
3) Product development	3103	3103	
4) Market development	3104	3104	
5) Accountability to customer demands	3105	3105	
6) Track customers' orders	3106	3106	
7) After-sales services	3107	3107	
8) The daily production rate	3108		3108
9) Making balance between supply and demands	3109		3109
10) Logistics operations	3110		3110
Financial function	3200	3200	
1) Profitability	3201	3201	
2) Return on investment(ROI)	3202	3202	
3) Cash Flow	3203	3203	
4) Cost benefit to competitor	3204	3204	
5) Demand forecast	3205	3205	
6) Inventories cost	3206	3206	
7) The cost and speed of production of goods and customers services	3207	3207	
8) Lag time (LT)	3208	3208	
9) Shareholders value	3209	3209	
10) Cost provision of human resources	32010		3210

11) Control and surveillance	3211		3211
12) Speed, accuracy, quality of information exchanged	3212		3212

Note:

1. Literature-based codes: the codes which we have seen in the literature and case study.
2. Research data-based code: the codes which we have seen in the case study

Table 2: The results Inter-case analysis

1) Supply chain communication system (sccs)	1100	1100	1100	1100
Electronic data interchange (EDI)	1200	1200	1200	1200
E-mail	1300	1300	1300	1300
Computer software	1400	1400	1400	1400
Internet network	1500	1500	1500	1500
website	1600	1600	1600	1600
Short messaging system	1700	1700		1700
Barcoding	1800			1800
2) What benefits are provided to your company by using information technology and what was the impact on capabilities of supply chain?	2000			
Data interchange	2100	2100	2100	2100
coordination	2200	2200	2200	2200
Integration of activities	2300			
Responsiveness of supply chain	2400			
Clarify information	2500	2500	2500	2500
Information analysis	2600	2600	2600	
3) What effect would be having when capabilities of supply chain used information technology?	3000			
Marketing and sale function:	3100			
1) Sales amount	3101	3101	3101	3101
2) Market share	3102	3102	3102	3102
3) Product development	3103	3103	3103	3103
4) Market development	3104	3104	3104	3104
5) Accountability to customer demands	3105	3105	3105	
6) Track customers' orders	3106			
7) After-sales services	3107	3107		3107
8) The daily production rate	3108	3108		3108
9) Making balance between supply and demands	3109	3109	3109	3109
10) Logistics operations	3110	3110	3110	3110
Financial function:	3200			
1) Profitability	3201	3201	3201	3201
2) Return on investment(ROI)	3202	3202		
3) Cash Flow	3203	3203		
4) Cost benefit to competitor	3204	3204	3204	3204
5) Demand forecast	3205	3205		3205

6) Inventories cost	3206			
7) The cost and speed of production of goods and customers services	3207	3207	3207	
8) Lag time (LT)	3208			
9) Shareholders value	3209	3209	3209	3209
10) Cost provision of human resources	3210	3210	3210	3210
11) Control and surveillance	3211	3211	3211	3211
12) Speed, accuracy, quality of information exchanged	3212	3212	3212	3212

Table 3: Result of Analysis Data

Supply chain communication system (sccs)	1100	✓	✓	✓
Electronic data interchange (EDI)	1200	✓	✓	✓
E-mail	1300	✓	✓	✓
Computer software	1400	✓	✓	✓
Internet network	1500	✓	✓	✓
website	1600	✓	✓	✓
Short messaging system (sms)	1700	✓	×	✓
Barcoding	1800	×	×	✓
2) What benefits are provided to your company by using information technology and what was the impact on capabilities of supply chain?	2000			
Data interchange	2100	✓	✓	✓
coordination	2200	✓	✓	✓
Integration of activities	2300	×	×	×
Responsiveness of supply chain	2400	×	×	×
Clarify information	2500	✓	✓	✓
Information analysis	2600	✓	✓	×
3) What effect would be have when capabilities of supply chain used information technology?	3000			
Marketing and sales function	3100			
1) Sales amount	3101	✓	✓	✓
2) Market share	3102	✓	✓	✓
3) Product development	3103	✓	✓	✓
4) Market development	3104	✓	✓	✓
5) Accountability to customer demands	3105	✓	✓	×
6) Track customers' orders	3106	×	×	×
7) After-sales services	3107	✓	×	✓
8) The daily production rate	3108	✓	×	✓
9) Making balance between supply and demands	3109	✓	✓	✓
10) Logistics operations	3110	✓	✓	✓
Financial function	3200			
1) Profitability	3201	✓	✓	✓
2) Return on investment(ROI)	3202	✓	×	×
3) Cash Flow	3203	✓	×	×
4) Cost benefit to competitor	3204	✓	✓	✓

5) Demand forecast	3205	✓	×	✓
6) Inventories cost	3206	×	×	×
7) The cost and speed of production of goods and customers services	3207	✓	✓	×
8) Lag time (LT)	3208	✓	✓	✓
9) Shareholders value	3209	✓	×	✓
10) Cost provision of human resources	3210	✓	✓	✓
11) Control and surveillance	3211	✓	✓	✓
12) Speed, accuracy, quality of information exchanged	3212	✓	✓	✓

4. Conclusions and Recommendations

In order to study the relationship between supply chain management and information technology, this research goes to answer three questions through a process of interviews in three studies of leather production manufacture in the East Azerbaijan province. This section examines the questions and answers were received from firms which were studied.

A. Question 1: Which of the information technology tools is used in your company?

In response to this question, companies A, B and C stated that in carrying out their activities in relation to raw material suppliers and specially customers in the supply chain, they use communication system, electronic data exchange, electronic mail, computer software, the Internet and Web sites. The system of sending sms in Company A and C, and barcoding tools only in Company C have been used. As noted in research history section, Yvlnjyn and Jura (2005) in survey the adoption of IT in supply chain management concluded that 67.6 percent of the studied companies use information technology in their supply chain.

The results also showed that the 81.7 percent of companies using the Internet and 56.3% of these companies use Internet networks. Most of the firms have website, use it to communicate with customers via e-mail, advertising sales and general activities and also, presentation of product information in a visual and verbal way.

B. Question 2: Use of information technology has what benefits for your company and, do have what impacts on supply chain capabilities?

In response to this question three companies A, B and C, have suggested that the use of information technology tools on supply chain capabilities such as exchange of information, coordination and transparency have a positive impact on information.

In addition, the companies A, B believe that using of these considered tools have some effects on another capability of supply chain that means data analysis. In other words, companies A, B and C, have noted that by using information technology tools, information clearly and transparently exchange between loop supply chain (ring

supplier), producer ring and customer ring (especially a generator ring and customer ring), and In addition, information exchange and coordination would be easier and faster. As you saw in the research history section, Yu and his colleagues in 2006 did a study to examine the impact of information technology on supply chain capabilities and companies performance, and concluded that placement of IT in supply chain communications systems can lead to the better possibility of supply chain in areas such as exchange of information, coordination, integration of supply chain activities and sensitivity. In other words, the adoption of IT in supply chain communication systems can improve information sharing and coordination among supply chain partners. Yvlnjyn and Jura in 2005 did a study to examine the adoption of information technology in their supply chain management, and concluded that for 18.3 percent of firms surveyed, quick access to information and improve data integration are most important reasons for using information technology in the supply chain.

C. Question 3: When supply chain capabilities use the IT impact, it has what effect on supply chain performance?

Based on the research process model, usage of information technology tools influences on supply chain capabilities and consequently, the performance of the supply chain is affected. According to the research process model, supply chain performance is divided into two parts: 1) marketing and sales performance; 2) financial performance.

Surveyed companies' responses to this question show the impact of information technology on supply chain capabilities, has a positive effect on some parts of marketing and sales functions, as well as the financial performances. As mentioned in the previous sections, Byrd and Davidson in 2003 did a research that surveyed the impact of information technology on supply chain and performance of business corporations, concluded that three factors including technical quality of IT department, usefulness of information technology program, senior managers' supporting of information technology positively and significantly influence on the impact of information technology on supply chain, and in this regard have a positive and significant relationship with the financial performance of the company. In performance marketing and sales, companies A, B and C stated that the use of information technology tools in sales amount and market distribution have increased, the process of product development and market development have improved, and the company could be easier, faster and more accurately make a balance between demand and supply and doing logistics operations. In addition, Benito in the 2007 did a study to examine the relationship between investments in information technology and operational efficiency in purchase, and concluded that basically, for implementation and promotion of some

developed procurement activities, such as cooperation with suppliers, supplier evaluation, involving suppliers in product development and design, and also logistic integration, adoption of information technology in the supply chain is essential. In other words, these activities for complete implementation and also, be quite efficient and effective need information technology. Notably, companies A and B believe that use of information technology tools to improve responsiveness to customer demands is so effective. Yu and his colleagues in their study in 2006 found that the acceptance of IT in supply chain communication systems can improve information sharing and coordination among supply chain partners. Information sharing in the network of supply chain can help companies to improve their prediction of market demand, reduce inventory costs and be more responsive to customer orders. In addition, companies A and C recommended that they have improved after-sales service to customers and the company can kindly determine the amount of daily production faster and more accurately. The financial performance section of the surveyed companies stated that the use of information technology tools, profitability, control and supervision of the activities, as well as speed, accuracy and quality of exchanged information (in particular the exchanged information between producers ring and customers ring) will increase and a cost superior is caused to participate rather than competitors.

Yvlnjyn and Jura that in a research in 2005 examined the acceptance of IT in the supply chain and, found that 12.3 percent of the surveyed companies stated that obtaining to competitive advantages and maintain the competitive advantages are some of the main reasons for them to use IT in supply chain. Notably, company A thought that the use of information technology tools to increase capital efficiency and speed cash flow (cash flow) is so effective. Also, companies A and C stated that through the information technology tools, can predict measure of sales (demands) more easy, accuracy and faster, so increase the value of Shareholders. Finn in his study (2006) examined effects of company sizes on relationship between acceptance level of IT and three levels of performance, including operational, strategic and financial and found that by using effective information technology (especially with the help of EDI) in conjunction with up-level and down-level partners in the supply chain, large manufacturers would be able to process information for various purposes such as predicting sales, production planning and inventory control, both effectively and efficiently; Thus, companies can react quickly. As a result, companies A and B, in addition to above advantages, know the use of said tools important to increase the speed of production and provide effective customer service. At the end of this section, the problems in the field of information technology in the supply chain would be pointed out and you can see some suggestions to solve them.

1. **Culture building in line with the use of information technology**: The use of information technology in the supply chain requires appropriate culturally infrastructure. Distributions of supply chain (suppliers, manufacturers and customers) are skeptical to the security of e-services and do not believe they can confidently use electronic services. For example, in Iran (East Azerbaijan province), customers (distribution agents and supermarkets) do not use the website of the company to order required products. This process is done in person or through phone calls.
2. **Convince companies to implement (implementation) information technology projects:** Unfortunately, some company do not consider the use of information technology tools as a competitive advantage and, prefer to invest in other sections (such as increase of production and …) rather than the fields of information technology; while in today world, success in supply chain management require use of IT tools.
3. **Asking the government to provide necessary facilities for using information technology:** The use of information technology tools requires equipment and facilities that the government could help companies through providing them. For example, through internet is prerequisite for the use of information technology tools and, actions of the government in order to provide it, play an important role in facilitating the use of said tools.

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