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The Applicability of an Integrated Supply-Chain: An Empirical Research on Large Organizations in Amman

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ABSTRACT

The ideal Integrated Supply Chain (ISC) is an integration of inter-organization and intra-organization processes and operations in a strategic and physical level with all network members to achieve the requested performance and to increase the value of the organization.

This study aimed to investigate the extent of applicability of ISC in the Jordanian market as a competitive advantage in the new global market. To achieve this objective, the study focuses on the dimensions of organization flexibility as an integration enabler, namely; Sourcing, Production, logistics and Product Development Flexibility as well as Information Technology (IT) Flexibility which is used as a support factor for all of the flexibility dimensions.

To study the relationship between the applicability of ISC and flexibility dimensions as well as the differences in implementing these dimensions related to independent variables, a questionnaire was designed and distributed to the largest industrial, services and retailers organizations in Amman, Jordan. The survey included 52 companies inside Amman with a capital equal to or greater than 10 million Jordanian dinar, where 42 of them participated in the study analysis.

The findings of the study prove the applicability of ISC and there is a relationship between applicability of ISC and organization flexibility determinants; which is consistent with previous studies. Also, there is a difference between companies applicability of ISC related to IT flexibility. The strongest driver was logistics flexibility. On the other hand, the study proves that there is no relationship between production flexibility and applicability of ISC in the Jordanian market, which is inconsistent with the previous findings. The study findings indicate that the higher organization flexibility, the higher the applicability of ISC and the better the organization performance.

It is recommended that an organization should work through partner relationships which is achieved by long-term agreements after implementing a robust evaluation system, and it is also recommended that organizations should adopt a policy of acquiring multipurpose resources for both sides of workforce: machines and humans.

Keywords: Applicability, Integrated Supply-Chain, Flexibility and Information Technology.

1. INTRODUCTION

Supply chain management is the process by which every stage of the procurement of goods or services is managed from beginning to end. It can extend from the end customer to second or third tier sub-contractors. The aim of supply-chain management is to improve the quality of the product or service being bought, to eliminate waste and excessive costs and to improve delivery times.

Supply Chain Management (SCM) is an important field for researchers where it forms a competitive advantage for organizations to compete locally and globally. Also, supply chain management is recognized as a contemporary concept that leads to achieving benefits

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of both operational and strategic nature (Al-Mudimigh *et al*., 2004). Thus, integrated supply-chain management approach is a competitive advantage for all organizations, whether it works in the field of manufacturing or service. The short-term objective of SCM is to increase productivity, reduce inventory and cycle time, while the long-term strategic goal is to increase customer satisfaction, market share and profits for all members of the virtual organization (Tan, 2002).

Enterprises must often streamline and integrate supply-chain operations by applying concepts that are well recognized in a developed environment. For example transforming their supply chains from traditional stand-alone, vertically-integrated entities with unsynchronized production processes and minimal information sharing, to integrated systems where multiple organizations work synergistically to facilitate synchronized production processes and information visibility for all parties. Many firms facing these challenges may not be managerially or technologically prepared to make such transitions. Thus, the development and implementation of integrated supply-chain processes to meet an increased demand for consumer goods in undeveloped environment may be far from a straightforward process (Ellinger and Kapoor, 2004).

The uncertainties in the supply-chain network make manufacturing enterprises inefficient. Three fundamental sources of uncertainty exist along with a supply chain. They are demand (volume and mix), process (yield, machine downtimes, transportation reliabilities), and supply (quality, delivery reliabilities). The variation in demand spreads upstream in an amplified form (i.e., demand distortion) (Dong, 2001). This suggests that in order to be competitive in the marketplace, an integrated supply chain is required to be able to produce various different products and deliver them to the market in an acceptable speed and cost. This implies that flexibility is an important competitive advantage a supply chain should pursue to win the intense competition (Pujawan, 2004). According to Pujawan (2004), investment for flexibility is often costly and thus, high flexibility should be pursued only if the market indicates the need for it.

Business communities have been realizing that being competitive as a single company is no longer adequate; instead, competitiveness requires consideration of all channels in the supply chain (Pujawan, 2004). Therefore, being flexible in the context of a manufacturing system is no longer adequate in the current competition. Flexibility should therefore be pursued by a supply chain, or at least by every function related to supply-chain activities.

There is a limited literature on supply-chain flexibility which provides the readers with a relatively simple and ready- to- use framework to assess supply chain flexibility (Pujawan, 2004). For this study, most important dimensions of flexibility were identified from previous literature addressing flexibility: Sourcing flexibility, Production flexibility, logistic flexibility, product development flexibility and IT flexibility. Thus we can determine the applicability of integrated supply chain since the higher the integrated supply chain flexibility, the higher the applicability of an integrated supply chain.

Importance of the Study

The importance of the study can be summarized by the following points:

1- Due to boundary-less trading resulted from the spread of IT applications which facilitates the transfer of information, the global competition is very high, thus as we perceived the importance of integrated supply-chain management approach as an advanced technique and tool to achieve the global competition, it is extremely important to know the Jordanian market orientations and its competency level to implement an integrated supply-chain system.
2- Studying the applicability of an integrated supply chain in Jordan will help the researchers and Jordanian decision makers in their future planning concerning the recommended sectors which are more suitable for competitive global investment.
3- Clarifying the most important factors affecting integrated supply-chain implementation as a managerial strategy approach.
4- Clarifying the relationship between applicability of an integrated supply chain and IT.

5- Emerging to which extent the Jordanian organizations are committed to implementing the new tactics in business environment through an empirical study.

Objectives of the study

The study aims to investigate the applicability of an integrated supply chain as a powerful tool for management to compete in local and global markets. Thus, in order for an organization to gain a competitive advantage from integrated supply chain, it is required to be able to produce various different products (production and product development flexibility) and be delivered to the market in an acceptable speed and cost (sourcing and logistic flexibility). To achieve the above-mentioned aim, the study will:

1- Investigate to which extent the large Jordanian enterprises implement sophisticated management approaches and adapt with new economic competition requirements, represented by integrated supply-chain management approach.
2- Investigate the readiness of Jordanian enterprises for an integrated supply chain.
3- Clarify the relationship between implementing integrated supply-chain management approach and enterprise performance.
4- Investigate the relationship between integrated supply-chain (ISC) applicability and sourcing, production, logistic and product development flexibility.
5- Investigate the difference in the ISC applicability between companies related to IT flexibility.

Through empirical study, this research will contribute to emphasize the need for implementing integrated supply-chain management approach, and for providing the techniques and tools that take into consideration the infrastructure of an integrated supply-chain success.

2. LITERATURE REVIEW

Supply Chain Definition

There are many definitions for Integrated Supply Chain done by researchers, the most important definitions are:

The definition of Integrated SCM as stated by Metz (1998):

"*Integrated Supply Chain Management (ISCM) is a process-oriented, integrated approach to procuring, producing, and delivering products and services to customers. ISCM has a broad scope that includes sub-suppliers, suppliers, internal operations, trade customers, retail customers, and end users. ISCM covers the management of material, information, and funds flows*."

Dong (2001) in his advanced research on Integrated Supply-Chain Management defines it as "*An integrated process wherein various business entities (i.e., suppliers, manufacturers, distributors, and retailers) work together in an effort to: (1) acquire raw materials, (2) convert these raw materials into specified final products, and (3) deliver these final products to retailers. This chain is traditionally characterized by a forward flow of materials and a backward flow of information.*" The Council of Supply-Chain Management Professionals (CSCMP) defines SCM explaining: "*Supply Chain Management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all Logistics Management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, Supply-Chain Management integrates supply and demand management within and across companies.*" (www.CSCMP.com, 2006).

The researchers define ISCM as an Integration of inter-organization and intra-organization processes and operations in a strategic (partnership agreements) and physical level (information transactions) with all network members to achieve the requested performance and to increase the value of the organization.

Supply-Chain Management (SCM)

Supply-Chain Management Rising

In the past, the traditional corporate model of organization was based on vertical integration, hierarchy, and functional management. The corporate decision-

making process was generally optimized within a single company through a cross-functional (general or multi-plant) integration. However, individual firms no longer compete as solely autonomous entities and inter-network competition is now one of the main characteristics of business (Lambert and Cooper, 2000). For example, marketing objectives of high customer service and maximum sales dollars conflict with the manufacturing and distribution goals. Many manufacturing operations are designed to maximize throughput and lower costs with little consideration for the impact on inventory levels and distribution capabilities. Purchasing contracts are often negotiated with very little information beyond historical buying patterns. The result of these factors is that there is no single integrated plan for the organization. Clearly, there is a need for a mechanism through which these different functions can be integrated together (Dong, 2001).

Also, during the last two decades, the demand was unpredictable in both quantity and quality, the international markets were too diversified and therefore difficult to forecast, and because the pace of technological change was huge, which made single-purpose production equipment obsolete, the mass-production system became too costly and too rigid. Emerging technologies now allow for the transformation of assembly lines characteristic of the large corporation into easy-to-program production units with product flexibility sensitive to market variations, and process flexibility sensitive to changes in technology (Gullberg and Lundvall, 2003).

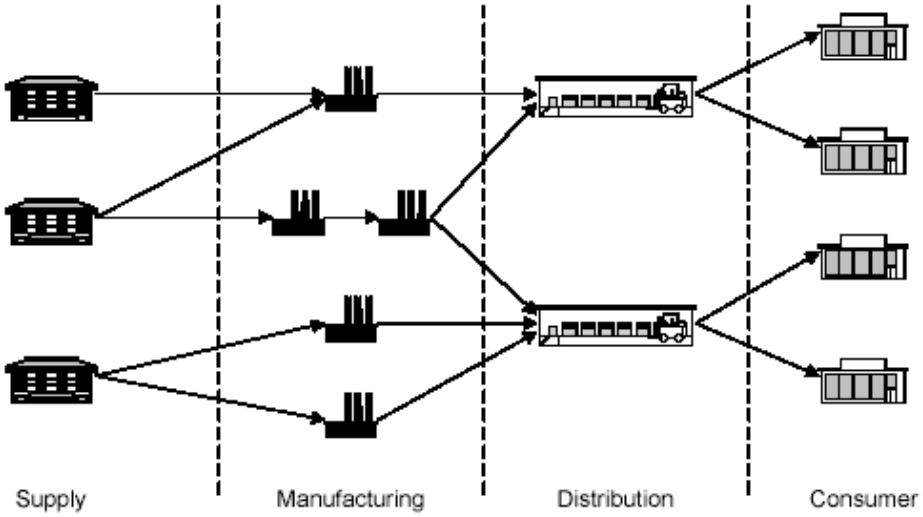
These highlight the need to form integration between all operations (marketing, distribution, planning, manufacturing, and the purchasing) not only inter-organization but also extending the integration outside the organization to reducing uncertainty and increasing information flows and knowledge exchange among organizations. Supply-Chain Management (SCM) is a strategy through which such integration can be achieved. Supply-chain management is typically viewed to lie between fully vertically integrated organizations, where the entire material flow is owned by a single firm, and where each channel member operates independently. Therefore, coordination between the various players in the chain is the key in its effective management (Dong, 2001).

The actual term SCM was introduced by consultants in the early 1980s, and picked up by academics at the end of that decade where its importance was extensively reiterated and intensively researched (Frohlich and Westbrook, 2001; Stock and Lambert, 2001); as it presented as the ultimate source for creating value or sustainable competitive breakthroughs (Lambert and Cooper, 2000).

Supply Chain Entities

In most of supply chains there are four main entities; (supply, manufacturing/production, distribution and customers/end users), which we can call different names according to the field of study (industry, retailer or services). The typical supply chain in industry field is depicted in Figure (1). Each entity/echelon of supply-chain may be comprised of numerous facilities. Thus, the complexity of the supply chain arises from the number of echelons in the chain and the number of facilities in each echelon. As the supply-chain becomes more complex, the integration will be more difficult.

Figure 1: Supply-Chain Entities. (Beamon, 1999), pp276.



Implementation of SCM

Introduction

Forces such as globalization, increased product variety, speeding up of technological innovation and shortening of product life cycles contributed to increase the complexity in configuring and managing intra-firm and inter-firm processes. Activities such as procurement, inbound logistics, internal operations and logistic, distribution and new product development now involve many different factors, inside and outside the company, and require several different skills: this scenario pushed companies to modify their supply-chain strategy (Perona and Saccani, 2002).

Both large and small/medium organizations have a vital role to play in the effective operations of these supply chains, the reason for that is to satisfy the demands of any market, since the operations of the organization rarely depend upon a single company. Usually, they depend upon several companies, each carrying out its own role effectively as part of a larger, overall supply chain.

At each stage in the supply chain, the integration between all organizations is a key method of improving the performance of the whole system. Each member in the chain presents two probabilities to the customer, either satisfy him or disappoint him, since this depends on the member performance, if it was good, he will represent an added value to the whole chain and vice versa (Hawkins, 2001).

Implementation of SCM involves identifying important supply chain members with whom it is critical to link, what processes need to be linked to each of these members, and what type or level of integration to apply for each process link. Process integration should aim at increasing total process efficiency and effectiveness across all members of the supply chain, not only across functions within single companies (Gullberg and Lundvall, 2003).

Supply Chain Integration Techniques and Tools

Supply-Chain Management is a field that interfere with many other disciplines such as marketing (customer-relationship management, buying strategies), industrial economics (make-or-buy, international purchasing, procurement, supplier evaluation), operations management (Just-In-Time (JIT), inventory management, production and distribution planning, transportation management), international business and organizational management (teams and internal coordination, strategic issues, organization and procedure, partnering and

strategic alliances), and information technology (electronic data interchange, online bidding, bar coding), which have precedent SCM as the ultimate goal of supply-chain management to integrate the processes of multiple firms. To achieve the goal of SCM, the proper techniques and tools should be used (Lejeune and Yakova, 2003).

After a comprehensive review of theoretical literature and case studies by Perona and Saccani (2002), they grouped all of the Integration Techniques and Integration Tools in three domains and subgroups and identified the most notable techniques and tools as follows:

Integration Techniques

Integration techniques can be defined as decisions on how to manage interface processes, and allow practically implementing and managing a relationship (Perona and Saccani, 2002). Integration techniques can be grouped into three classes:

1- Operations management techniques which serve to co-ordinate trading partners' logistic and manufacturing processes, this is sub-grouped into five areas:
   a- Lean Replenishment: techniques that could be adopted in this area are: Just-in- Time (JIT), Frequent Deliveries, Continuous Replenishment Program (CRP) and Vendor Managed Inventory (VMI) (Marien, 2001).
   b- Coordinated Materials Management: techniques that could be adopted in this area are: Quality Certifications, Free-pass Supplies and Mediated Purchasing (Lejeune and Yakova, 2003).
   c- Coordinated Operations Planning and Control: techniques could be adopted in this area are: Blanket Orders, Rolling Budget, Booking/ Purchasing/ Joint Dimensioning of Production, Capacity and Collaborative Planning, Forecasting and Replenishment (CPFR) (Johnson, 1999).
   d- Coordinated Distribution Configuration: techniques that could be adopted in this area are: Warehouses Network Reconfiguration, Pipeline Shortening and Collocation (Fawcett, 1996).
   e- Coordinated Distribution Management: techniques that could be adopted in this area are: Distribution Requirement Planning (DRP), Multi-pick and Multi-drop Systems and Collaborative Transportation Management (CTM) (Christopher and Towill, 2000).
2- Technology management techniques which serve to co-ordinate and involve suppliers within customer's new product and process development activities, this is sub-grouped into two areas (Lee and Billington, 1993):
   a- Joint Re-design: techniques that could be adopted in this area are: Joint Process Re-design and Product Design /Re-design for Supply-chain Management.
   b- New Product Development (NPD): techniques that could be adopted in this area are: Co-design, Virtual Engineering and Joint Technological Innovation.
3- Joint strategic planning techniques that aimed to share the definition of business and market objectives and directly involve firms' top management. Strategic planning may be considered an interface process as well as logistics or new product development; the following techniques could be adopted in Coordinated Strategic Planning class: Coordinated Market Expansion Plans and Coordinated Business Focalization (Perona and Saccani, 2002).

Adopting integration techniques will help organizations to improve their efficiency or effectiveness in interface processes management. For instance, firms adopting Vendor Managed Inventory (Operations management techniques) to manage the replenishment process may reach inventory reduction (improvement in the customer's side), higher service level and an optimization of production planning (improvement in the supplier's side). Also, coordinated operations planning and control techniques (such as blanket orders) are aimed at reducing inventory cost and achieving superior service levels, by improving supplier's knowledge of customer's needs over longer time periods (Perona and Saccani, 2002).

Integration Tools

Integration tools can be defined as the resources and

assets dedicated to support or enable the adoption of one technique or more. (Perona and Saccani, 2002)

Integration tools can be grouped into three classes:

1- Information tools serve to improve the efficiency and the effectiveness of the exchange of information in operations management, logistics and new product development, this is sub-grouped into four areas:
   a- Electronic Procurement: tools that could be adopted in this area are: Electronic Data Interchange (EDI), E-marketplaces and Internet-Based Interactive Partnering (I-BIP) (Gullberg and Lundvall, 2003).
   b- Information Integration: tools that could be adopted in this area are: Integrated Production and Inventory Data Bases, Integrated DRP schedules and Integrated Engineering Data Management (EDM), and Product Data Management (PDM) (Lee and Billington, 1993).
   c- Electronic Monitoring Systems: tools that could be adopted in this area are: Deliveries Monitoring and Product Tracking Systems and Automated Identification Systems (Fawcett, 1996).
   d- Groupware Applications: tools that could be adopted in this area are: Computer-Supported Cooperative Work (CSCW), Integrated Computer-Aided Design (CAD) and Integrated Computer-Aided Manufacturing (CAM) (Katayama and Bennett, 1999).

2- Management tools are used to plan, measure, control and motivate the performances of interface processes. These tools can be seen as the inter-firm extension of classical management control systems, which is sub-grouped into four domains:
   a- Supplier Evaluation Systems: tools that could be adopted in this domain are: Vendor Selection Systems (VSS) and Vendor Rating Systems (VRS) (James *et al.,* 1997).
   b- Supply-chain Cost Accounting Systems: tools that could be adopted in this domain are Inter-organizational Cost Management and Kaizen Costing (Cooper and Slagmulder, 1999).
   c- Supply-chain Performance Metrics: the tool that could be adopted in this domain is Supply-chain Performance Measurement Systems (Kleijnen and Smits, 2003).
   d- Supply-chain Incentive Systems: the tool that could be adopted in this domain is: Cross-firm Incentive Systems and Contracts (Lee and Billington, 1993).

3- Organization tools are a means to improve interface processes performances in cases of complex interaction, allowing the physical contact between the functions and/or operations involved in these processes, these tools are sub-grouped into two domains:
   a- Interface roles: tools that could be adopted in this domain are: Resident Engineers and Interface Managers (Cooper *et al*., 1997).
   b- Cross-firm Organizational Units: tools that could be adopted in this domain are: New Product Development Teams and Product-process Improvement Teams (Swafford *et al*., 2000).

The implementation of one or more tools may be absolutely necessary to the adoption of a technique, or may add value to it, by increasing efficiency and/or effectiveness gains. For instance, the Vendor Managed Inventory (VMI) cannot be adopted without thorough information integration between buyer and supplier (through integrated inventory databases). On the other hand, groupware applications supporting communication, like videoconferencing and integrated CAD/CAM applications, support co-design team members by improving information sharing quality and speed: this may result in higher design quality or reduced time-to-market (Perona and Saccani, 2002).

Supply-Chain Types

Researchers Naim *et al.* (1999) and Christopher *et al*. (2000) have distinguished between two main types of supply-chains, Lean Supply-chain (LSC) and Agile Supply-chain (ASC):

Lean Supply-chain (LSC)

A Lean Supply Chain (LSC) employs continuous improvement efforts that focus on eliminating waste or

non-value steps along the chain. It is supported by efforts to achieve internal manufacturing efficiencies and setup time reduction, this enables the economic production of small quantities and enhance cost reduction, profitability, and manufacturing flexibility to some degree. The short setup times provide internal flexibility, but an LSC may lack external responsiveness to customer demands, which require flexibility in product design, planning and scheduling, and distribution in addition to manufacturing (Vonderembse *et al.,* 2006).

Agile Supply-chain (ASC)

The Agile Supply Chain (ASC) concept relates to the interface between companies and markets, an external perspective on flexibility. Successful implementation involves responding to rapidly changing and continually fragmenting global markets by being dynamic, context specific, growth-oriented, flexible across the organization, and driven by customer. An ASC focuses on responding to unpredictable market changes and capitalizing on them through fast delivery and lead-time flexibility. It deploys new technologies, methods, tools, and techniques to solve unexpected problems. It utilizes information systems and technologies as well as electronic data interchange capabilities to move information faster and make better decisions.

ASC places more emphasis on organizational issues and people (knowledge systems and empowered employees), so that decision-making can be pushed down the organization. It is a systematic approach that integrates the business, enhances innovations across the company, and forms virtual organizations and production entities based on customer needs (Vonderembse *et al.,* 2006).

Both Naim *et al.* (1999) and Christopher *et al.* (2000) showed the similarities between the lean and the agile paradigms. A useful way to relate the lean and agile paradigms is to consider their delivery of the total value. The main difference between the two paradigms is in their ability to cope with uncertainty, including variations in production volume and the degree of product variety required. Whilst leanness may be an element of agility in certain circumstances, by itself it will not enable the organization to meet the precise needs of the customer more rapidly (Christopher *et al.,* 2000). Agile businesses may be seen as more robust, and hence flexible than lean ones. Such businesses are able to respond to variations and disturbances. This is in contrast to the requirements of a lean business for stability. Also, by its nature a lean business ensures that stability is attained by implementing suitably simple and optimum processes and procedures. Stability is achieved by making use of market knowledge and information and long-term forward planning (Naim *et al.,* 1999).

In addition to LSC and ASC, Christopher and Towill (2000) suggest a hybrid supply-chain model, dependent on the decoupling points for material flow and information flow. The decoupling point separates the part of the supply-chain oriented towards customer orders from the part of the supply-chain based on planning. The proper location of decoupling points is determined by how lean (upstream) or agile (downstream) supply-chain and the "order fulfillment process" should be. The issue here is to bring together the best of different lean and flexible/agile paradigms, towards a "leagile" model. (O'Brien *et al.,* 2004).

The lean and agile paradigms may be selected according to marketplace requirements. These are distinctly different, since in the first case the market winner is cost, whereas in the second case the market winner is availability. The agile supply-chain is market sensitive which mean that the supply-chain is capable of reading and responding to real demand (Christopher *et al.,* 2000).

What Distinguishes this Study From Other Studies?

This study is distinguished from previous studies, in respect to its population sample, as it includes manufacturing and non-manufacturing firms; also, the study focuses on the role IT plays on the applicability of ISC.

3- RESEARCH METHODOLOGY

Research Variables

The variables of this study are based on the most important variables of the previous studies which

influence the applicability of integrated supply chain.

1. The independent variables are these Integrated Supply-chain flexibility drivers: sourcing flexibility, production flexibility, logistic flexibility and product development flexibility.
2. The moderating variable is Information Technology (IT) flexibility as the information tools improve the efficiency and the effectiveness of the exchange of information inter-organization and intra-organizations, which, in its turn, have a large role in determining the extent of sourcing flexibility, production flexibility, logistic flexibility and product development flexibility which will increase the applicability of an integrated supply chain.
3. The dependent variable is the applicability of Integrated Supply Chain as a measure to the extent to which the large Jordanian organizations adopted ISCM approach.

Table (3.1) summarizes the variables and presents the measurement tools of the study variables. The relationships between the study variables are illustrated in Figure (3.1).

Table (3.1)
Variables of the Study and Their Measurements Tools

Dependent Variable	Moderate Variable	Independent Variables
Applicability of Integrated Supply-chain (Q. 1-14)	Information Technology Flexibility (Q.83-98)	Sourcing Flexibility (Q. 15-30)
		Production Flexibility (Q. 31-47)
		Logistics Flexibility (Q. 48-63)
		Product Development Flexibility (Q. 64-82)

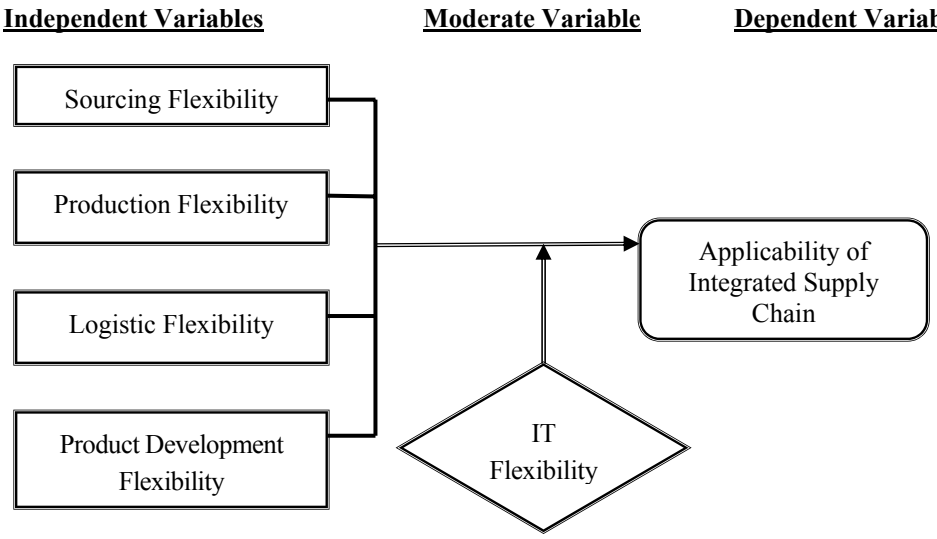


Figure 2: The Study Model.

The Study Model

Theoretical and Operational Definitions

Applicability of Integrated Supply Chain

The dependent variable can be identified by the existence of certain factors that represent the readiness of an environment for the Integrated Supply-chain system; such as, the existence of an IT unit, Research and Development (RandD) unit, quality control unit, implementation of Total Quality Management (TQM), implementation of new technologies (JIT, CAM/CAD, …), long-term agreements with the suppliers, reduction in the production cost, transportation cost and purchasing cost, reduction in inventory level, improvement of supplier selection and evaluation and improvement in customer service.

This variable will be measured by questions from 1-14 in the second part of the questionnaire.

Sourcing Flexibility

Sourcing flexibility is the ability of the purchasing function to respond in a timely and cost- effective manner to change the requirements of purchased components. Sourcing flexibility facilitates a faster response when there is uncertainty; therefore, sourcing flexibility has a positive impact on production flexibility (Swafford *et al.,* 2000). The uncertainty of supply is related to the competition in obtaining the materials, the availability of alternative sourcing, and the nature of raw materials' availability. The supply characteristics directly affect the need for supply flexibility. Indirectly, Supply Uncertainty also corresponds to the need of production and delivery flexibility (Pujawan, 2004) Supplier selection becomes a central concern as the buyers look to form strategic partnerships (Spekman, 1988). A growing emphasis on establishing long-term channel relationships, driven by competitive pressures and business complexity, has encouraged many firms to become highly selective in their choice of supplier. To build more effective relationships with suppliers, organizations are using supplier selection criteria to strengthen the selection process.

Integrating sourcing flexibility with integrated supply-chain management supports an organization's ability to deliver products and services in a more timely, effective manner (Tan *et al.,* 1998), thus; the higher flexibility of sourcing, the higher applicability of integrated supply-chain. The relationship between customer and supplier is the most important one as it affects more than one dimension. Stuart (1993) concludes that supplier partnerships lead to both short-term and long- term benefits especially in the areas of product development. The supplier will have more accumulated information on the product and processes which should improve their performance in the areas of cost, quality, and delivery.

The higher Sourcing Flexibility means that the organization suppliers are able to deliver most materials in various different speed options, and to mix different items into a delivery load so that small requests can be satisfied easily with reasonably low extra costs; this enables the organization to implement change orders in a time and cost effective manner (Pujawan, 2004). This variable will be measured by questions from 15-30 in the second part of the questionnaire.

Production Flexibility

Production flexibility is related to the ability of the organization to produce products of different types and different volume at an acceptable speed and cost (Pujawan, 2004).

Production flexibility enables an organization to adapt its production strategy to environmental changes. Gupta and Somers (1996) define volume flexibility as "*The ability of a manufacturing system to be operated profitably at different overall output levels.*" Therefore, the higher ability to change production capacity to adapt to the demand means the higher production flexibility. Other element of production flexibility is Product Mix flexibility which is defined by Koste and Malhotra (1999) as "*The number of products which can be produced.*" An organization with the ability to adapt production to different product specifications can exhibit faster product completion; and thereby reducing the overall delivery time.

Also, the higher ability to change workforce capability (human resources or machines) means the higher production flexibility; at the same time, if the

organization has more than one facility in different geographical locations, its production will be more flexible if they are able to relocate products and processes among facilities (Swafford *et al.,* 2000).

This variable will be measured by questions from 31-47 in the second part of the questionnaire.

Logistics Flexibility

The Council of Logistics Management defines Logistics as "*The process of planning, implementing and controlling the efficient, effective flow and storage of materials, finished goods, services and related information from origin to the location where they are used*." (Fawcett and Clinton, 1996). The New Generation Manufacturing (NGM) study's attribute of customer responsiveness is influenced by logistics flexibility. If the organization has higher logistics flexibility, it will have an opportunity to be more customers-responsive with respect to product delivery (Swafford *et al.,* 2000). The logistics function is a critical dimension of time-based competitive strategies for companies (Fawcett and Clinton; 1996). Changes in overall warehouse structure, distribution of product among warehouses, transportation network and mode, all do impact supply-chain significantly (Swafford *et al.,* 2000).

The higher the ability to change planned delivery modes or times; the higher the Logistics flexibility. For example, in case of emergency needs, speeding up the delivery of products is possible either by choosing a faster mode of transportation or by other means. Also, the higher ability to track worldwide shipments means higher Logistic Flexibility. On the other hand, the high ability to fill orders from alternate global facilities is an important element to measure the Logistic Flexibility; as well as the high ability to change total storage capacity or delivery capacity (Pujawan, 2004). This variable will be measured by questions from 48-63 in the second part of the questionnaire.

Product Development Flexibility

Product development flexibility is the ability to develop diverse products and/or product enhancements in a timely and cost effective manner in response to customer or market requirement, to exploit market opportunities, or to employ technological enhancements (Swafford *et al.,* 2000). Higher product design flexibility increases the ability to make changes later in the development cycle (Thomke, 1997), thus increasing organization flexibility. The Next Generation Manufacturing (NGM) Project study's attribute of customer responsiveness such as ability to meet customer needs is supported by an increase in product development flexibility. With higher flexibility in product development, the organization will have more ability to introduce products in response to the change in customer expectations or technology. An organization simultaneously developing multiple generations of a product would have a greater opportunity to effectively incorporate new customer expectations into the design, and thus become more applicable for integrated supply chain (Swafford *et al.,* 2000).

The other important elements of Product Development Flexibility are the ability of organization to provide the requirements of product development such as the high ability to supply the new materials, outsourcing product development where applicable by reasonably low costs, also providing the technology and other resources that enable them to easily create, modify and simulate the designs, especially when the product design activities are done with collaboration of a remotely dispersed team (Pujawan, 2004).

This variable will be measured by questions from 64-82 in the second part of the questionnaire.

Information Technology (IT) Flexibility

Information technology flexibility is the ability of an organization's collective Information Technology System to adapt to and support the changing requirements of the business with respect to the flexibility dimensions of product development, sourcing, production and logistics as well as other strategic goals (Swafford *et al.,* 2000). Integrated Supply-chain Management (ISCM) development has a significant relation with utilizing Information Technology (IT) across the boundaries of firms (Wang *et al.,* 2004).

There are three different activities within a

manufacturing business unit as being related to success of an integrated supply-chain. These activities are using CAD/CAM, integrating information systems within manufacturing, and integrating information systems across functions within the business unit (Katayama and Bennett, 1999).

Firms along the entire integrated supply-chain have various intentions and perceived benefits in associated with IT investments, resulting in different degrees of information systems readiness. Consequently, understanding the intrinsic factors of the adoption of IT becomes essential and critical for those firms trying to extend and maximize the capability and utilization of IT systems in facilitating logistics, collaborative designs, Original Equipment Manufacturing (OEM) and other inter-firm business activities (Wang *et al.,* 2004). If the organization does effectively utilize its IT, information is more accessible thus improving decision making processes and providing a competitive advantage (Swafford *et al.,* 2000). Thus Information tools improve the efficiency and the effectiveness of the exchange of information in operations management, logistics and new product development which will increase the applicability of an integrated supply-chain. Thus the higher IT capability means higher IT Flexibility, and the larger perceived benefits of expanding the adoption of Integrated Supply-chain (Chang and Shaw, 2004). This variable will be measured by questions from 83-98 in the second part of the questionnaire.

Research Hypotheses

The most important dimensions of integrated supply-chain flexibility identified by the researchers will be tested to study its relationship with the applicability of an integrated supply chain, those dimensions are: Sourcing flexibility, production flexibility, logistic flexibility, product development flexibility and Information Technology (IT) flexibility. The following null hypotheses were developed to be tested by this study:

Main Hypothesis

Ho-There is no relationship between the independent variables and the applicability of ISC.

Sub-Hypotheses

Ho1-There is no relationship between sourcing flexibility and ISC applicability.

Ho2- There is no relationship between production flexibility and ISC applicability.

Ho3-There is no relationship between logistic flexibility and ISC applicability.

Ho4-There is no relationship between product development flexibility and ISC applicability.

Ho5-There is no difference in the ISC applicability between the companies related to IT flexibility.

Ho6-There is no difference in the sourcing flexibility between the companies related to IT flexibility.

Ho7-There is no difference in the production flexibility between the companies related to IT flexibility.

Ho8-There is no difference in the logistic flexibility between the companies related to IT flexibility.

Ho9-There is no difference in the product development flexibility between the companies related to IT flexibility.

Population and Sample

The research concentrated on large enterprises in Amman-Jordan, therefore; the population of the this study consists of all organizations in Amman that have capital equal to or greater than 10 million Jordanian Dinar and work in field of manufacturing and trading services (except financing companies due to their high sensitivity to provide information) according to Companies Control Department registration, in addition to the largest retailers companies in Amman. The survey includes the whole population which consists of 52 organizations, 44 of them agreed to fill the questionnaires, 2 of the returned questionnaire contained missing items, leaving 42 questionnaires for study analysis, with a response rate of 80.7% which is considered an acceptable rate (Sekaran, 2003).

Data Collection Methods

Two scientific methodologies have been used in this research:

Literature Review: A review of most previous related studied, articles and books to develop understanding of Integrated Supply-chain management techniques, tools and functions. Variables, dimensions and elements of integrated supply-chain flexibility and performance of old researches were considered and the most effective variables are used for this study.

Empirical Methodology: A questionnaire was developed to empirically test the research hypotheses in different large Jordanian enterprises (Manufacturing, Services and Retailers sectors). In some cases, a combined unstructured interviews accompanying questionnaires distribution were conducted to increase the credibility of data gathering by questionnaire and to deeply investigate the relationships between research variables.

Appendix (1) contained a copy of the questionnaire questions, where part (1) included demographic information and part (2) questions related to research hypotheses using 5-point Likert scale to examine how strongly subjects agree or disagree with statements (The questions are based on Swafford *et al.* (2000) and Pujawan (2004) studies).

The Goodness of Data

Reliability and validity: The goodness of the measures is established through testing the reliability and validity of the measurement tool (questionnaire) of this study. Cronpach Alpha coefficient was used to test the reliability of the questionnaire and it was found that (α=0.922) which is good because it is greater than (0.6) (Sekaran, 2003).

The content validity of the questionnaire, as tested in previous studies, was found to be high (based on Swafford *et al.* (2000) and Pujawan (2004) studies). Moreover, the questionnaire was reviewed by a number of expert judges, who gave their notices and recommendations.

Normality of Data: Kolmogorov-Smirnov (K-S) Normality test was used to test normality of the data for each variable independently, and it was found that the significance for each variable is greater than (0.05) which reflects the normality of the data, and the results are shown in table (3.2).

Table (3.2)-Normality Test

Variables	Sig.
Applicability of ISC (Dependent Variable)	0.574
Sourcing Flexibility (Independent Variable 1)	0.186
Production Flexibility (Independent Variable 2)	0.409
Logistic Flexibility (Independent Variable 3)	0.669
Product Development Flexibility (Independent Variable 4)	0.662
IT Flexibility (Moderate Variable)	0.382

Data Analysis and Interpretation Methods

The collected data were analyzed using two scientific methods:

1- Descriptive statistics (i.e. Central Tendency, Frequency Distribution) for the general characterization of study variables, and the analysis statistics was conducted on the surveyed data using Statistical Package for Social Sciences (SPSS) software (version 12).

2- The following analysis statistics have been used to test the hypotheses:
   a- Multiple regression analysis was conducted to find the relationship between dependent and independent variables.
   b- A simple regression analysis was conducted to evaluate the strength of association between independent variables and dependent variable.
   c- Pearson correlation coefficient to evaluate the strength and direction of relationships association between dependent and independent variables.

Research Limitations

The following points represent the limitations that faced the researchers while doing this study:

1- Small size of the population and sample.
2- Lack of the diffusion knowledge about ISCM implementation on the Jordanian market.
3- Lack of previous Arabic and Jordanian studies on Integrated Supply-chain Management.

3. DATA ANALYSIS

Sample Characteristics

The studied sample consisted of 42 companies, the findings of the statistical data analysis of frequency and percentage are mentioned below.

Organization Type:

Table (4.1) Sample Companies' Business Form According to the Ownership		
TYPE	**FREQ**	**%**
Public Shareholding Companies	23	54.8
Private Shareholding Companies	5	11.9
Private Companies	13	30.9
Others	1	2.4
Sum	42	100

It was found that 54.8% of the sample are Public Shareholding Companies.

Working Field:

Table (4.2) Sample Companies According to Economic Sector		
Field	**FREQ**	**%**
Manufacturing	31	73.8
Retailers	3	7.1
Trading Services	8	19.1
Sum	42	100

It was found that 73.8% of the sample are working in the industry sector.

Organization Age (years):

Table (4.3) Sample Companies Age		
Age	**FREQ**	**%**
Less than 5	10	23.8
5-less than10	4	9.5
10-less than 15	14	33.3
15-less than20	6	14.3

It was found that 33.3% of the sample are companies aged between 10 years and less than 15 years.

Number of Production Branches:

Table (4.4) Sample Companies' Production Branches		
No. of Production Branches	**FREQ**	**%**
1 branch	27	64.3
2 braches	4	9.5
3 branches or more	11	26.2
Sum	42	100

It was found that 64.3% of the sample are companies that have only one branch.

Number of Workers:

Table (4.5) No. of Workers in Study Sample		
Workers	**FREQ**	**%**
150 or less	7	16.7
150-300	12	28.6
301-500	8	19
Above500	15	35.7
Sum	42	100

It was found that 35.7% of the sample are companies employing 500 workers and above.

Using IT:

Table (4.6) Age of IT Using in Study Sample		
IT Using (Years)	**FREQ**	**%**
Less than 1year	-	-
1- less than 2	6	14.3
2- less than5	4	9.5
5 and above	32	76.2
Sum	42	100

It was found that 76.2% of the sample use Information Technology since 5 years and ahead, considering that the age of 10 companies was less than 5 years (Table 4.3).

The sample characteristics tables shown above indicates that most of the studied organizations are working in the industrial sector and they are public shareholding organizations. At the same time, most of them are modern companies (whose age is less than 15 years); and this interprets the high implementations of IT in these organizations. This implies that the size, nature of works, and age of these organizations represent the suitable environment for implementing integrated supply-chain approach.

Descriptive Analysis

Mean and standard deviation were used to describe attitude toward the following questions:

1- Dependent variable: Applicability of Integrated Supply-chain Management

Table (4.7) Applicability of ISCM Descriptive Analysis		
Measure tool	**Mean**	**Std. Deviation**
Q1	4.2143	0.97620
Q2	3.5476	1.27265
Q3	4.0714	1.15596
Q4	4.2619	0.82815
Q5	3.9524	1.08093
Q6	3.9286	1.04515

Q7	3.8095	0.83339
Q8	3.7857	0.92488
Q9	3.7143	0.89131
Q10	3.7619	0.90553
Q11	2.9048	1.00752
Q12	3.5476	0.80251
Q13	4.0238	0.64347
Q14	3.9524	0.69677

Table (4.8)
Sourcing Flexibility Descriptive Analysis

Measure tool	Mean	Std. Deviation
Q15	4.2619	0.66478
Q16	3.4286	1.03930
Q17	3.5476	0.91605
Q18	2.5238	0.96873
Q19	3.0238	0.94966
Q20	2.9048	0.82075
Q21	3.9524	0.58236
Q22	3.2619	0.82815
Q23	3.6667	0.84584
Q24	3.8571	1.00174
Q25	3.5476	1.06387
Q26	4.0000	0.66259
Q27	3.8810	0.91605
Q28	4.0000	0.62470
Q29	3.5000	0.99388
Q30	3.6429	0.85029

Table (4.7) shows a positive attitude toward all questions (except Q11) because their means are above (3), which reflects the degree of the readiness of the environment and the infrastructure for the integrated supply-chain management in the studied sample, especially factors related to quality management, supplier selection/evaluation systems and IT systems.

Meanwhile, it was found that there is a negative attitude toward Q11 *(Implementation of the new production technology as CAD/CAM, JIT...)* because its mean (2.9048) is less than (3). This could be explained as that the Jordanian companies in general are not adopting such systems yet, either because of their relatively small sizes, or because they are in the infancy, or at their most growth stage, or because of the lack of needed skilled staff and the required financial resources.

2- Independent Variable 1: Sourcing Flexibility

Table (4.8) shows a positive attitude toward all questions (except Q18 and Q20) because their means are above (3), this implies that organizations work on providing the elements which support companies sourcing flexibility, especially, the existence of more than one qualified supplier to supply the requested items in

packages or separate orders and arrangement of transportation by different modes as needed.

Meanwhile, it was found that there is a negative attitude toward Q18 *(Existing of large extra total supply capacity for most items)* and Q20 *(Capability of most suppliers of producing a small quantity due to relatively low setup costs)*, because their means are less than (3). This implies that if we have an unexpected demand, there will be difficulties to supply large amounts of materials used in operations; one of the reasons for this is that most local organizations depend on outsourcing (foreign markets) to supply raw materials where two factors considered as obstacles appeared here; the first one is that in most of the advanced countries the dominant orientation is to produce only according to orders. The second factor is that Jordan market is considered as a relatively small market size compared with the international markets, where almost the minimum order quantity is designed for large market sizes which lead to the rise of the cost of small ordered sizes.

The other reason which is more applicable for the supply of local raw materials is the lack of using advanced technology in production, which leads to high cost of production change setup, which, in its turn, leads to the rise in the cost of unexpected demand, or the cost of supplying a small quantity.

3-Independent variable 2: Production Flexibility

According to table (4.9), it was found that there is a positive attitude toward Q32, Q33, Q34, Q35, Q37, Q38, Q40, Q42, Q43, Q44 and Q46 because their means are above (3), but their means indicate that there is almost no strong positive attitude for production flexibility factors, and this is an indication of the lack of interest to provide elements which enhance the organization's production flexibility. Bearing in mind that Jordan is considered a semi-industrialized country, the fact that reflects the lack of the spread of developed production requirements, especially in industry sector, appeared through questions with a negative attitude.

Table (4.9)
Production Flexibility Descriptive Analysis

Measure tool	Mean	Std. Deviation
Q31*	3.7381	1.10563
Q32	3.7143	0.83478
Q33	3.5476	0.80251
Q34	3.7619	0.75900
Q35	3.0238	0.94966
Q36	2.0476	0.85404
Q37	3.5000	1.08762
Q38	3.3095	1.17884
Q39	2.5238	1.25403
Q40	3.7143	0.89131
Q41	2.8333	0.88115
Q42	3.0714	0.92110
Q43	3.4762	1.15269
Q44	3.4524	1.13056
Q45	2.5476	0.99271
Q46	3.5238	0.91700
Q47	2.7381	0.93859

* Note: Marks of Q31 have been changed because this question has a negative direction.

Meanwhile, Table (4.9) shows that there is a negative attitude toward Q31 *(There is no multiple production facilities that are located at different sites)*, Q36 *(The machines are multipurpose so they are able of processing various different tasks/jobs)*, Q39 *(There are alternative routings to produce a product)*, Q41 *(Costs implication of changing the schedule is low, thus changes may be requested within a short interval of time*), Q45 *(Always possible to move products around different production lines at different locations)* and Q47 *(The time required to produce a new product mix always responded to the demand)* because their means are less than (3).

Question 36, Q41 and Q47 are interrelated, since production of mix products in short time needs machines with multipurpose capabilities, here the same interpretation mentioned for Q11 above is applicable. Also, Q31, Q39 and Q45 are interrelated, since it is impossible for organizations with only one branch to

produce in different locations. The description analysis of the study sample indicates that 64.3% of the total sample has only one production branch.

4-Independent variable 3: Logistics Flexibility

Table (4.10) shows a positive attitude toward all questions (except Q52, Q61 and Q62) because their means are above (3), this is an indication that Jordanian organizations are perceiving the importance of providing logistics flexibility elements such as the availability of different modes of transportation according to status requirements from both sides; quantity and speed, as well as the availability of short-response time and possibility of determining shipping problems; which means high cooperation between different parties. This reflects that Jordanian organizations are supporting factors which emphasize logistics flexibility.

Table (4.10)
Logistics Flexibility Descriptive Analysis

Measure tool	Mean	Std. Deviation
Q48	4.0714	0.74549
Q49	3.7857	0.97620
Q50	4.0000	0.79633
Q51	4.2381	0.57634
Q52	2.9762	1.07040
Q53	3.6905	0.94966
Q54	3.9286	0.67690
Q55	3.2381	0.72615
Q56	3.6429	0.79084
Q57	3.9524	0.79487
Q58	3.4048	1.10563
Q59	3.6190	0.85404
Q60	3.4048	0.91223
Q61*	3.0714	0.92110
Q62	2.7143	0.96993
Q63	4.1190	0.86115

* Note: Marks of Q61 have been changed because this question has a negative direction.

Meanwhile, it was found that there is a negative attitude toward Q52 *(In case of emergency needs, speeding up the delivery of products is possible by choosing a faster mode of transportation)*, Q61 *(The time between customer order receipt and product delivery is almost changeable)* and Q62 *(Different materials can be transported along the delivery routes)*, because their means are less than (3). The result of Q52 indicates that there is a difficulty in providing faster transportation mode in emergency cases; this may belong to the interrelation between volume of fast transportation traffic and volume of the country's commercial activities, where it is generally considered low to medium for Jordan and the Middle East. On the other hand, the result of Q61 indicates that there is a complaint from unfixed delivery time; the interpretation mentioned for Q52 above concerning volume of commercial activities is applicable partially for this result in addition to the political situation of the area, which was unstable in the last two decades.

5- Independent variable 4: Product Development Flexibility

Table (4.11) shows a positive attitude towards all questions (except Q67, Q74 and Q77) because their means are above (3). This result indicates that Large Jordanian organizations recognize, to a specific limit, the importance of research and development as a competitive advantage. Also, it reflects their attention on the elements of product development flexibility; especially those related to customization (develop new products according to customers' expectations by economic solutions).

Table (4.11)
Product Development Flexibility Descriptive Analysis

Measure tool	**Mean**	**Std. Deviation**
Q64	3.8810	0.80251
Q65	4.0714	0.71202
Q66	3.5238	0.80359
Q67	2.8810	1.06387
Q68	3.5476	0.99271
Q69	3.6667	1.00406
Q70	4.0476	0.69677

Q71	3.8333	0.76243
Q72	4.2143	0.51965
Q73	4.0476	0.62283
Q74	2.6429	0.85029
Q75	3.5000	0.94353
Q76	3.6905	0.92362
Q77	2.6190	1.03482
Q78	3.7857	0.64527
Q79	3.7381	0.62701
Q80	3.3095	0.74860
Q81	3.2143	0.75015
Q82	3.1905	0.77264

Meanwhile, it was found that there is a negative attitude toward Q67 *(The development cycle time is almost low)*, Q74 *(The organization always benefits from the technologies (CAD, CAM…) used in production)* and Q77 *(Almost outsourcing product development activity, where applicable, incurs reasonably- low costs)* because their means are less than (3). The result of Q67 reflects the nature of the undeveloped markets, where the spread of high technology industry -which is characterized by low development cycle- is still weak. It is clear that the result of Q74 is compatible with the result of Q11 where both questions are related to the same idea. Also, the result of Q77 is logical due to the fact that the transfer of researches and developments from developed countries to undeveloped countries always face many obstacles.

6-Moderate variable: Information Technology (IT) Flexibility

Table (4.12) shows a positive attitude toward Q83, Q84, Q85, Q86, Q87, Q89, Q91, Q92, Q93, Q96, Q97 and Q98 because their means are above (3), this result indicates the readiness of IT systems for implementation of integrated supply-chain management for most of sampled companies, although the benefits of IT systems are not fully recognized by all companies, where we couldn't find a strong positive attitude for most factors of IT flexibility. This is normal in such an environment where spread of virtual organizations is still limited.

Table (4.12)
IT Flexibility Descriptive Analysis

Measure tool	Mean	Std. Deviation
Q83	3.6190	0.93580
Q84	3.7381	0.85709
Q85	3.5952	0.93859
Q86	3.7381	0.85709
Q87	3.6190	1.05812
Q88	2.8333	0.93487
Q89	3.6905	0.89683
Q90	2.6905	0.94966
Q91	3.6667	0.84584
Q92	3.4762	0.96873
Q93	3.5952	1.01356
Q94	2.5000	1.06496
Q95	2.0952	0.65554
Q96	3.2857	1.11061
Q97	3.3571	1.03173
Q98	3.4524	0.99271

On the other hand, Table (4.12) shows that there is a negative attitude toward Q88 *(The IT system supports new products development)*, Q90 *(The IT system supports new global distribution channels)*, Q94 *(Electronic Monitoring systems are used for tracking deliveries)* and Q95 *(CAD/CAM systems used in integrated supply-chain are integrated)* because their means are less than (3). The results of negative attitudes toward question Q88 indicate that the dependence on IT systems to support new product development with the supply-chain network is low; although the descriptive analysis of product development flexibility shows interest on new product development, this could be interpreted as a low trust and lack of partnership relations between network entities. Also, the results of Q90 and Q94 respectively indicate that sampled local organizations don't exploit the power of IT in a good manner to penetrate foreign markets, and the tracking of delivery process is almost not controlled by the IT system. Finally, again the negative attitude toward Q95 is the result of questions related to using

advanced technology for production processes similar to the results of Q11 and Q74 above.

Hypotheses Testing and Results Discussion

Testing the Main Hypothesis:

Ho - There is no relationship between the independent variables and the applicability of ISC.

Table (4.13)
Multiple Regression Test Results of the Main Hypothesis

F calculated	F tabulated	F sig.	Result of H0	R	R^2
8.608	2.68	0.000	reject	0.694	0.482

Table (4.14)
Simple Regression Test Results of Independent Variables

Hon (Sub-Hypotheses)	T calculated	T tabulated	T sig.	Result of Hon	R	R^2
Ho1	3.449	2.0195	0.001	reject	0.479	0.229
Ho2	*1.556*	*2.0195*	*0.128*	*accept*	*0.239*	*0.057*
Ho3	5.527	2.0195	0.000	reject	0.658	0.433
Ho4	2.59	2.0195	0.013	reject	0.379	0.147
Ho5	4.94	2.0195	0.000	reject	0.616	0.379
Ho6	2.734	2.0195	0.009	reject	0.397	0.158
Ho7	5.551	2.0195	0.000	reject	0.660	0.436
Ho8	4.738	2.0195	0.000	reject	0.600	0.360
Ho9	3.635	2.0195	0.001	reject	0.498	0.248

Multiple Regression was used to test the main hypothesis, and it was found that calculated F (= 8.608) is greater than tabulated F (2.68) as shown in Table (4.13).

The decision rule is that: Accept H0 if the calculated value is less than the tabulated value and rejects H0 if the calculated value is greater than tabulated value. So, the null hypothesis will be rejected and the alternative hypothesis substantiated, which means that there is a relationship between the independent variables (Sourcing Flexibility, Production Flexibility, Logistics Flexibility and Product Development Flexibility) and Applicability of Integrated Supply-chain (ISC). From the result of Pearson Correlation coefficient (R = 0.694), independent variables are significantly and positively correlated to applicability of ISC, i.e. there is a strong relationship between organization flexibility determinants and applicability of ISC, where R^2 value (0.482) indicates that 48.2% of the variability has been explained by the independent variables, which also means that the higher the organization flexibility, the higher applicability of ISC, where higher Applicability of ISC indicates higher organization performance (less lead time, less purchasing cost, less production cost, less shipment cost and less storage cost).

This result is consistent with the findings of Beamon (1999), Swafford *et al*., (2000), Prater *et al*., (2001), Graves and Tomlin (2003), Pujawan (2004) and Hofmann and Reiner (2006).

This result indicates that the applicability of ISC exists in large Jordanian organizations. This could be due to the fact that most companies in our sample are modern companies, where (66.6%) of these organizations' age is less than 15 years (Table 4.3).

Testing Sub-Hypotheses

Simple Regression was used to test Sub-hypotheses

(Hon) and the results as shown in Table (4.14).

The decision rule is that: Accept Hon if the calculated value is less than tabulated value, and reject Hon if the calculated value is greater than tabulated value.

1- Testing Sub-Hypothesis (1):

Ho1- There is no relationship between sourcing flexibility and ISC applicability.

According to table (4.14) and the decision rule, the null hypothesis will be rejected and the alternative hypothesis substantiated, which means that there is a relationship between Sourcing Flexibility and ISC Applicability. From the result of Pearson Correlation coefficient (R= 0.479), Sourcing Flexibility is significantly and positively correlated to applicability of ISC. The value of R^2 indicates that only 22.9% of the variance has been explained by the independent variable.

This result is consistent with the findings of Koste and Malhotra (1999), Swafford *et al*. (2000), Prater *et al*. (2001), Gullberg and Lundvall (2003), Graves and Tomlin (2003), Pujawan (2004) and Hofmann and Reiner (2006).

This finding indicates that Sourcing Flexibility is an important dimension for Integrated Supply-chain and it supports previous findings. Also, it is an indication that large Jordanian organizations recognize the importance of sourcing flexibility and supply with its critical elements such as qualified suppliers and availability of different transportation modes.

2- Testing Sub-Hypothesis (2)

Ho2- There is no relationship between production flexibility and ISC applicability.

According to Table (4.14) and the decision rule, the null hypothesis Ho2 is substantiated. This means that there is no relationship between ISC applicability and production flexibility. From the result of Pearson Correlation coefficient for this variable (R= 0.239), Production Flexibility is weakly correlated to applicability of ISC. The R^2 (0.057) indicates that only 5.7% of the variability has been explained by the related independent variable.

This result is inconsistent with the previous findings of Koste and Malhotra (1999), Swafford *et al*. (2000), Chang *et al*. (2001), Prater *et al*. (2001), Graves and Tomlin (2003), and Pujawan (2004) and Hofmann and Reiner (2006). This result means that the ability of organization to produce products of different types and different volumes with a reasonable cost and according to the requested speed is limited. Therefore, its capability to compete in this fast-pace age is limited.

Descriptive analysis of Production Flexibility mentioned in section (4.1.2) lead to conclude that major reasons of this result -inflexible production system of large Jordanian firms- are that these companies, relatively speaking, are small sized companies with limited financial resources, skilled manpower resources, and limited market size, hence its limited capacity, which leads to the low ability of production system to respond to the change in demand. This could be clearer in the industry sector, especially due to factors related to production like the low capabilities of machines. This appeared by investigating the questions of table (4.9) with negative attitude.

3- Testing Sub-Hypothesis (3)

Ho3- There is no relationship between logistic flexibility and ISC applicability.

According to Table (4.14) and the decision rule, the null hypothesis will be rejected and the alternative hypothesis substantiated, which implies that there is a relationship between ISC applicability and logistics flexibility. From the result of Pearson Correlation coefficient (R= 0.658), Logistics Flexibility is significantly and positively correlated to applicability of ISC.

This result is consistent with the findings of Swafford *et al*. (2000), Chang *et al*. (2001), Prater *et al*. (2001), Graves and Tomlin (2003), and Pujawan (2004) and Hofmann and Reiner (2006).

The value of R^2 indicates that 43.3% of the variance has been explained by the independent variable, as well as the positive attitude toward most of logistics flexibility elements shown in table (4.10) which proves that most of large Jordanian firms recognize importance of Logistics

Flexibility as one of the main critical success factors for integrated supply-chain implementation.

4- Testing Sub-Hypothesis (4)

Ho4- There is no relationship between product development flexibility and ISC applicability.

According to Table (4.14) and the decision rule, the null hypothesis will be rejected and the alternative hypothesis substantiated. So, there is a relationship between ISC applicability and product development flexibility. From the result of Pearson Correlation coefficient (R= 0.379), Product Development Flexibility is positively correlated to applicability of ISC.

This result is consistent with the findings of Koste and Malhotra (1999), Swafford *et al*. (2000), Chang *et al*. (2001), Graves and Tomlin (2003), Pujawan (2004) and Hofmann and Reiner (2006). The value of R^2 indicates that 14.7% of the variance has been explained by the independent variable.

This result indicates that there is a little concern in new product development by large Jordanian firms, where this concern is not strong enough to say there is a high level of Product Development Flexibility, this could be due to the high cost of research and development, which is still concentrated only in the developed countries.

5- Testing Sub-Hypothesis (5)

Ho5- There is no difference in the ISC applicability between the companies related to IT flexibility.

According to Table (4.14) and the decision rule, the null hypothesis Ho5 is rejected and the alternative hypothesis substantiated. This means that there is a difference in the ISC applicability between the companies related to IT flexibility. From the result of Pearson Correlation coefficient (R= 0.616), difference in the applicability of ISC between companies is significantly and positively correlated to IT Flexibility. The R^2 (0.379) indicates that 37.9% of the variance has been significantly explained by the moderate variable.

This result is consistent with the findings of Swafford *et al*. (2000), Chang and Shaw (2004), Fawcett *et al*., (2005) and Hofmann and Reiner (2006). This result proves the readiness of large Jordanian firms regarding IT systems which support implementation of Integrated Supply-chain management. This readiness was measured in both sides, human resources and machines capabilities; where it was found more effective in human side as well as more efficient to serve inter-organization operations than intra-organization operations.

6- Testing Sub-Hypothesis (6)

Ho6- There is no difference in the sourcing flexibility between the companies related to IT flexibility.

According to table (4.14) and the decision rule, the null hypothesis will be rejected and the alternative hypothesis substantiated. So, there is a difference in the sourcing flexibility between the companies related to IT flexibility. From the result of Pearson Correlation coefficient (R= 0.397), difference in the Sourcing Flexibility between companies is positively correlated to IT Flexibility. The value of R^2 indicates that 15.8% of the variance has been explained by the independent variable.

This result is consistent with the findings of Swafford *et al*. (2000), Chang and Shaw (2004), Fawcett *et al*. (2005) and Hofmann and Reiner (2006). Also, this result proves that IT capabilities of large Jordanian firms serve inter-organizational operations more than intra-organizational operations, where most of sourcing processes are between different entities in the supply-chain network especially those that request a high level of trust on the supplier side, such as sourcing information related to production process like raw materials, capacity and storage quantity, which is interpreted by the value of R in table (4.19) above compared with the value of R in tables (4.20), (4.21) and (4.22) below.

7- Testing Sub-Hypothesis (7)

Ho7- There is no difference in the production flexibility between the companies related to IT flexibility.

According to table (4.14) and the decision rule, the null hypothesis Ho7 is rejected and the alternative hypothesis substantiated. So, there is a difference in the production flexibility between the companies related to IT flexibility.

From the result of Pearson Correlation coefficient (R= 0.660), difference in the Production Flexibility between companies is significantly and positively correlated to IT Flexibility. The value of R^2 indicates that 43.5% of the variance has been significantly explained by the set of predictors. Since the significance level T sig. ($p < 0.000$), then there is 0% chance for this result not to be held true.

This result is consistent with the findings of Swafford *et al*. (2000), Chang and Shaw (2004), Fawcett *et al*. (2005) and Hofmann and Reiner (2006). In this case, it was found that the value of R is high in table (4.20) where most of production processes are done internally with the different organization units (inter-organizational processes), which support the interpretation mentioned in the above sub-hypothesis concerning the differences in the level of IT flexibility related to organization processes type. Also, value of R in table (4.20) shows that the strongest difference in the level of IT flexibility related to organization processes type is for production process, which partially interprets the result of sub-hypothesis (2), that the Production Flexibility does not support the Applicability of ISC in the Jordanian market.

8- Testing Sub-Hypothesis (8)

Ho8- There is no difference in the logistic flexibility between the companies related to IT flexibility.

According to table (4.14) and the decision rule, the null hypothesis will be rejected and the alternative hypothesis substantiated. This implies that there is a difference in the logistic flexibility between the companies related to IT flexibility. From the result of Pearson Correlation coefficient (R= 0.600), difference in the Logistics Flexibility between companies is significantly and positively correlated to IT Flexibility. The value of R^2 indicates that 36% of the variance has been significantly explained by the set of predictors.

This result is consistent with the findings of Swafford *et al*. (2000), Chang and Shaw (2004), Fawcett *et al*. (2005) and Hofmann and Reiner (2006). The strong differences in the logistic flexibility between the companies related to IT flexibility in the field of delivery and shipment processes are presented because these information are insensitive which leads to a very strong and mutual interchange of information between companies who's highly exploited their Information Technology capabilities.

9- Testing Sub-Hypothesis (9)

Ho9- There is no difference in the product development flexibility between the companies related to IT flexibility.

According to table (4.14) and the decision rule, the null hypothesis will be rejected and the alternative hypothesis substantiated. Thus, there is a difference in the product development flexibility between the companies related to IT flexibility. From the result of Pearson Correlation coefficient (R= 0.498), difference in the Product Development Flexibility between companies is positively correlated to IT Flexibility. The R^2 (0.248) indicates that 24.8% of the variance has been significantly explained by the set of predictors. Since the significance level T sig. ($p = 0.001$), then there is 0.001% chance for this result not to be held true.

This result is consistent with the findings of Swafford *et al*., (2000), Chang and Shaw (2004), Fawcett *et al*., (2005) and Hofmann and Reiner (2006). This finding is compatible with the result of sub-hypothesis (4) where both of them indicate that there is no high level of concerning by large Jordanian firms with the new product development and no concerning with providing the supporting tools for it. As mentioned in the analysis of Sub-Hypothesis (4), this could be due to the high cost of research and development, which is still concentrated only in the developed countries.

Main Results and Recommendations

Based on the previous discussion, the following results and recommendations can be presented:

First: The Results

1. The results show a negative attitude toward adopting advanced technology in production *(Implementation of the new production technology as CAD/CAM, JIT...)*, which is consistent with the results of this study concerning the relationship

between production flexibility and applicability of ISC.

2. The study findings indicate a high significance regarding supplier selection process, availability of different modes of transportation to supply the requested materials, possibility to supply the requested materials individually when they are needed without incurring high extra cost and possibility of pooling demands from multiple sources. On the other hand, the results show a low negative attitude regarding the capability of most suppliers of producing small quantities of requested items; also, most of the participants in the study sample find it difficult to provide large extra quantities of the requested items.
3. The study results indicate a high statistical significance concerning the ability of the total production capacity to accommodate the increasing demand to a certain level which includes two sides, high availability of human resources and high flexibility of production schedule. While availability of multiple production facilities and/or multipurpose machines as well as the possibility to move products around different production lines in different locations were proved to be statistically insignificant.
4. The study findings indicate a high significance regarding availability of different modes of transportation (which is consistent with the findings related to sourcing flexibility), ability to deliver small quantity to the customer and availability of multiple possible carriers per delivery mode.
5. The study findings indicate a high significance regarding the possibility to introduce products in response to changing customer expectations, the ability to re-use the resources used in old projects, the high ability to exploit the knowledge from one project to design another project, and the high ability to utilize common parts in product design.
6. The study findings show that there is a difference between companies in the applicability of ISC related to IT flexibility, and also, in all the organization's flexibility determinants used in this study, which reflect the high influence of IT flexibility on other variables.

Second: The Recommendations

a- Recommendations for Businesses

1- According to the result of the main hypothesis, it is recommended that an organization concentrates on all factors which emphasize its flexibility and is reflectrd positively on its supply-chain network, starting with process management; analyze the core activities, and then optimization could be achieved by using modern tools such as business process improvement and business process re-engineering. Where ISC means integration of inter-organization and intra-organization processes, therefore, processes should be surrounded with measurement to ensure that it performs in the most effective and efficient ways.

2- It is recommended that organizations has to work through partnerships relations which is achieved by long-term agreements after implementing a robust evaluation system to select their partnerships. The mutual trust is the core of this relationship between organizations who has adopted Supply-chain Management as a strategic approach and work hard to provide all success factors of network integration by using supply-chain integration tools and techniques (mentioned in section 2.3.2) where and when applicable to enhance inter- and intra-organization flexibility as well as to be in touch with the latest developments in this area. The result of partnership relation should lead to free sharing of information and mutual collaborative of various capabilities and should reflect both short-term and long-term benefits for both sides.

3- It is recommended to implement the tools of new production technology such as CAD/CAM, JIT, where the results of this study show that there is a weak intention to adopt these technologies and this is reflected negatively on production flexibility of the organization and supply-chain network. This means

that the ability of the organizations to produce products of different types and different volumes at an acceptable speed and cost are limited. Therefore, it is recommended that companies, especially in the industry sector, should adopt a policy for acquiring multipurpose resources as much as possible for both sides: machines and human, by training their employees to do multi-tasks. On the other hand, adopting new technologies is recommended due to its high impact on all product development cycle as; product design flexibility, lead time, and meeting customer expectation and at the end of the day it will affect the cost of product development.

Thus, it is recommended that organizations who have inflexible product development process should search for a reasonable low cost outsource product development if it is not possible to improve their local capabilities, as product development flexibility is an important factor in organization flexibility and play a major role in market competitiveness.

4- Value supply-chain network happens only if there is a good integration between supply-chain entities and IT systems as it is the key for this integration. Therefore, it is highly recommended that organizations facilitate the expansion of their knowledge by improving and optimizing their IT systems. In this study, it was found that there should be more focus on IT systems related to product development and logistics as well as on advanced technologies for industry sector.

5- Local Organizations should deploy the awareness of integrated supply-chain benefits as a competitive tool which could be achieved by employees training, as well as implementing integrated- supply-chain management's software solutions which will facilitate its integration with international organizations.

b- Recommendations for Future Researches

Directions for future research can be presented as follow:

1. The sample of this research includes different business fields; it is recommended to conduct similar researches separately, since each field has its specific environment, which determines in depth the nature of work and its requirements. This concentration will allow researchers to determine critical success factors of integrated supply-chain management for each field in addition to the supporters/ obstacles factors to establish partnership relations with network entities.
2. Conducting case studies researches on ISCM implementation in Jordanian firms to collect the data directly from the source through contact system implementation, and this is to make precise evaluation for the effect of adopting ISCM approach on organization performance.
3. Conduct researches on different enterprise sizes (Large, medium and small) as well as on larger sample sizes.

REFERENCES

Al-Mudimigh, A., Zairi M., and Ahmed, A.M. 2004. Extending the Concept of Supply Chain: The Effective Management of Value Chains. ***International Journal of Production Economics***, 87, 309-320.

Beamon B. M. 1999. Measuring Supply Chain Performance. ***International Journal of Operations and Production Management,*** 19(3): 275-292.

Chang H. and Shaw M. 2004. Developing the Readiness Index of IT-enabled Supply Chain Collaboration. Retrieved May 10, 2005, from ***http://citebm.business.uiuc.edu.***

Chang, S., Yang, C., Lin, N. and Sheu, C. 2001. Mapping Manufacturing Flexibility with Business Strategy: An Empirical Study. ***Proceedings of the 6th Asia Pacific Decision Science Conference***, Singapore.

Christopher, M., and Towill, D. 2000. Supply Chain

Migration From Lean and Functional to Agile and Customized. ***Supply Chain Management: An international Journal***, 5(4): 206-213.

Cooper M.C., Ellram L.M., Gardner J.T. and Hanks A.M. 1997. Meshing Multiple Alliances. ***Journal of Business Logistics***, 18(1): 67-90.

Cooper, R. and Slagmulder, R. 1999. Develop Profitable New Products with Target Costing. ***Sloan Management Review***, 40(4): 23-33.

Council of Supply-chain Management Professionals. Retrieved February 6, 2006, from ***http: //www.CSCMP.com.***

Dong, M. 2001. ***Process Modeling, Performance Analysis and Configuration Simulation in Integrated Supply Chain Network Design.*** Unpublished Doctoral Dissertation, Virginia Polytechnic Institute and State University, USA.

Ellinger, A. and Kapoor, V. 2004. Transforming Supply Chain Operations in Response to Economic Reform. ***Supply Chain Management: An International Journal***, 9, 16-22.

Fawcett, E. and Clinton, R. 1996. Enhancing Logistics Performance to Improve the Competitiveness of Manufacturing Organizations. ***Production and Inventory Management Journal***, First Quarter, 40-46.

Fawcett, S. E., Magnan, G.M. and McCarter, M.W. 2005. ***Benchmarking Information Integration in Supply-chain Management: A Multi-Channel Approach.*** Working paper, Urbana-Champaign, University of Illinois, USA.

Frohlich, M. T., Westbrook R. 2001. Arcs of Integration: An International Study of Supply Chain Strategies. ***Journal of Operations Management***, 19, 185-200.

Graves, S. C. and Tomlin, B. T. 2003. Process Flexibility in Supply Chains. ***Management Science***, 49(7): 907-919.

Gullberg, M. and Lundvall, P. 2003. ***Retail Supply Chain Management -A Case Study of the Relationship Between Retail Value Propositions and Supply-chains***. Unpublished Masters Thesis, Göteborg University, Göteborg, Swede. Retrieved October 11, 2005, from http://www.handels.gu.se/epc/archive/00003650.

Gupta, Y.P. and Somers, T.M. 1996. Business Strategy, Manufacturing Flexibility, and Organizational Performance Relationships: A Path Analysis Approach. ***Production and Operations Management***, 5(3): 204-233.

Hawkins, L. 2001**.** ***Fundamental Productivity Improvement Tools and Techniques for SME***. Prime Faraday Partnership, Wolfson School of Mechanical and Manufacturing Engineering- Loughborough University, Loughborough, Leics. Retrieved February 6, 2006, from http:// www.primetechnologywatch.org.uk/ documents/ productivity-improvement. pdf.

Hofmann P. and Reiner G. 2006. Drivers for Improving Supply-chain Performance: An Empirical Study. ***International Journal of Integrated Supply Management,*** 2(3): 214-230.

James R., Rich N. and Francis M. 1997. VMI: A Processual Approach. ***Proceedings of the 6th International Annual IPSERA Conference***, Ischia, Italy 24-26 March, 1-14.

Johnson M., 1999. Collaboration Data Modeling: CPFR Implementation Guidelines. ***Proceedings of Council of Logistics Management Annual Conference***. Retrieved January 12, 2006, from http:// www.vics.org/ apps/ group_public/ download.php /25/ Collaboration DataModelingA. pdf.

Katayama, H. and Bennett, D. 1999. Agility, Adaptability and Leanness: A Comparison of Concepts and a Study of Practice. ***International Journal of Production Economics***, 62(1/2): 43-51.

Kleijnen, J. and Smits, M. 2003. Performance Metrics in Supply-chain Management. ***Journal of the Operational Research Society***, 0, 1-8.

Koste, L.L. and Malhotra, M.K. 1999. A Theoretical Framework for Analyzing the Dimensions of Manufacturing Flexibility. ***Journal of Operations Management,*** 18, 75-93.

Lambert, D.M., and Cooper, M.C. 2000. Issues in Supply Chain Management. ***Industrial Marketing Management***, 29(1): 65-83.

Lee, H.L. and Billington, C. 1993. Material Management in Decentralized Supply Chains. ***Operations Research***, 41, 835-847.

Lejeune, M.A. and Yakova, N. 2003. On Characterizing the 4 C's in Supply Chain Management. ***Journal of Operations Management***, 23(1): 81-100.

Marien, E.J., 2001. ***Demand Planning and Sales Forecast: A Supply Chain Essential.*** The Supply-chain Yearbook, 2001 edition. McGraw-Hill. Retrieved February 6, 2006, from http:// www.uwexeced.com/ supplychain/ pdf/ Marien2. pdf

Metz, P. 1998. Demystifying Supply-chain Management. ***Supply Chain Management Review***, Winter, 46-55.

Naim, M., Naylor, J., and Barlow, J. 1999. Developing Lean and Agile Supply-chains in the UK Housebuilding Industry. ***Proceedings of IGLC-7***, Berkeley, CA, USA, 26-28 July, 1999, 159-170.

O'Brien, W., London, K. and Vrijhoef, R. 2004. Construction Supply Chain Modeling: A Research Review and Interdisciplinary Research Agenda. ***Journal of Operations Management,*** 3(3): 64-84. Retrieved February 6, 2006, from http: //www.cpgec.ufrgs.br /norie/ iglc10 /papers /62-O'BrienEtAl.pdf.

Perona, M. and Saccani, N. 2002. Integration Techniques and Tools to Manage Customer-Supplier Relationships: An Empirical Research in the Italian Industry of Household Appliances. ***Twelfth International Working Seminar on Production Economics***, Igls/Innsbruck, Austria, 18-22 February, 2002, Vol (3).

Prater, E., Biehl, M. and Smith, M.A. 2001. International Supply Chain Agility: Tradeoffs Between Flexibility and Uncertainty. ***International Journal of Operations and Production Management,*** 21(5-6): 823-839.

Pujawan, I.N. 2004. Assessing Supply Chain Flexibility: A Conceptual Framework and Case Study. ***International Journal of Integrated Supply Management***, 1(1): 79-97.

Sekaran U. 2003. ***Research Methods for Business: A Skill Building Approach***, 4th Ed. New York: John Wiley and Sons.

Spekman, R.E. 1988. Strategic Supplier Selection: Understanding Long-Term Buyer Relationships. ***Business Horizons***, July-August, 75-81.

Stuart, F. 1993. Supplier Partnerships: Influencing Factors and Strategic Benefits. ***International Journal of Purchasing and Materials Management***, 29(4): 22-28.

Swafford, P., Ghosh, S. and Murthy, N. 2000. ***A Model of Global Supply-chain Agility and its Impact on Competitive Performance: Phase Two-Survey Development***. Working Paper, Center for International Business Education and Research, Georgia Institute of Technology, Atlanta, USA.

Tan, K.C. 2002. Supply Chain Management: Practices, Concerns, and Performance Issues. ***The Journal of Supply Chain Management,*** 38(1): 42-53.

Tan, K.C., Kannan, V.R., and Handfield, R.B., 1998. Supply Chain Management: Supplier Performance and Firm Performance. ***International Journal of Purchasing and Materials Management,*** 34(3): 2-9.

Thomke, S.H. 1997. The Role of Flexibility in the Development of New Products: An Empirical Study. ***Research Policy***, 26, 105-119.

Vonderembse M., Uppal M., Huang S. H., Wang G., and Dismukes J. P. 2006. Designing Supply Chains: Towards Theory Development. ***International Journal of Production Economics***, 100(2): 223-238.

Wang, Y., Chang, C. and Heng, M. 2004. The Levels of Information Technology Adoption, Business Network, and a Strategic Position Model for Evaluating Supply Chain Integration. ***Journal of Electronic Commerce Research***, 5(2): 85-98.

Appendix 1: Research Questionnaire

الجامعة الأردنية
كلية الدراسات العليا
ادارة الأعمال

عزيزي المشترك:
أعدت هذه الاستبانة لدراسة ادارة سلسلة التزويد المتكاملة (Integrated Supply Chain Management)، ويعرف بالعملية التي يتم فيها ادارة كل مرحلة من مراحل شراء الخدمة أو البضائع من بدايتها الى نهايتها و بالتنسيق بين الموردين و المصنعين أو مقدمي الخدمة والموزعين، ولنستطيع فهم هذا النظام ارجو تعاونكم معنا وملء هذه الاستبانة بالمعلومات اللازمة التي تدور حول تطبيق هذا النظام بدقة.
سيتم التعامل مع اجاباتك ومعلوماتك بسرية تامة ولن يطلع عليها الا أعضاء فريق البحث ولن يتم ذكر اسماء في البحث وانما سيشار لها بأرقام تعريفية تستخدم لاغراض المتابعة، وسنكون شاكرين لكم جدّا على معلوماتكم الدقيقة واعطائنا من وقتكم الثمين دقائق ومساعدتكم لنا لاتمام هذا البحث.
نحن على أتم استعداد لتزويدكم ان رغبتم بنتائج البحث بعد اتمام التحليلات اللازمة.
– أرغب بنسخة من نتائج البحث [ ] لا أرغب [ ]

أولا: المعلومات عامة

تصنيف المؤسسة:
( ) شركة مساهمة عامة ( ) شركة مساهمة خاصة
( ) شركة تضامنية ( ) غير ذلك

طبيعة عمل المؤسسة:
( ) صناعة ( ) خدمات
( ) تجارة ( ) غير ذلك

عمر المؤسسة:
( ) أقل من 5 سنوات ( ) من5 إلى أقل من10 سنوات
( ) من 10إلى أقل من 15 سنة ( ) من 15 إلى أقل من 20 سنة
( ) 20 سنة فأكثر

عدد فروع المؤسسة المنتجة
عدد العاملين في المؤسسة
مضى على إدخال تكنولوجيا المعلومات في نظام العمل:
( ) أقل من سنة واحدة ( ) من1إلى أقل من 2 سنة
( ) من 2 إلى أقل من 5 سنوات ( ) 5 سنوات فأكثر

ثانيا: معلومات تتعلق بسلسلة التزويد المتكامل

الرجاء الإجابة عن الأسئلة الآتية بوضع اشارة (X) تحت الإجابة الأكثر دقة بالنسبة إليكم ولكم جزيل الشكر.

***تطبيق إدارة سلسلة التزويد المتكاملة:**

		غير موافق بشدة	غير موافق	محايد	أوافق	أوافق بشدة
1	يوجد قسم تكنولوجيا معلومات منفصل في المؤسسة					
2	مدير قسم تكنولوجيا المعلومات له دور في كل العمليات					
3	يوجد قسم ضبط جودة مستقل في المؤسسة					
4	تطبق المؤسسة نظاما لإدارة الجودة					
5	يوجد قسم خاص للبحث والتطوير في المؤسسة					
6	توجد اتفاقيات للتعاون مع المزودين طويلة الأمد					
7	أصبح انجاز العمل يتم بوقت أقل بعد تطبيق ادارة سلسلة التزويد المتكاملة					
8	يوجد انخافض في كلفة المشتريات بعد تطبيق ادارة سلسلة التزويد المتكاملة					
9	يوجد انخافض في كلفة الانتاج بعد تطبيق ادارة سلسلة التزويد المتكاملة					
10	يوجد انخافض في كلفة النقل بعد تطبيق ادارة سلسلة التزويد المتكاملة					
11	تطبق المؤسسة أنظمة تكنولوجيا التصنيع الحديث مثل JIT(Just in Time) CAD (Computer Aided Design) and CAM (Computer Aided Manufacturing)					
12	يوجد انخافض في كلفة التخزين بعد تطبيق ادارة سلسلة التزويد المتكاملة					
13	المؤسسة لديها برنامج لاختيار وتقييم الموردين					
14	دائما تتمتع المؤسسة برضى العملاء					

***مرونة التوريد:**

		غير موافق بشدة	غير موافق	محايد	أوافق	أوافق بشدة
15	يوجد للمؤسسة أكثر من مورد معتمد (مؤهل) لكل مادة					
16	غالبا ما تكون التكاليف قليلة في حالة تغيير مصدر شراء المواد					
17	معظم الموردين يملكون القدرة لانتاج/ توريد أنواع مختلفة من المواد					
18	يوجد فائض كبير من معظم المواد التي يتم استخدامها					
19	معظم الموردين لديهم المقدرة لانتاج كميات كبيرة من المواد في وقت قصير نسبيا					
20	معظم الموردين لديهم القدرة لانتاج كميات صغيرة بفارق قليل نسبيا في الكلفة					
21	تستطيع المؤسسة اختيار وسائل نقل متعددة لاحضار المواد من الموردين					
22	يمكن طلب كميات قليلة من معظم المواد					
23	يمكن من الناحية الفنية جمع مواد متعددة في الشحنة الواحدة					
24	معظم الموردين قادرين على تسليم الطلب المستعجل بوسيلة نقل سريعة مقابل زيادة بسيطة في الكلفة					
25	تملك المؤسسة القدرة على اقامة علاقة شراكة مع موردي معظم موادها					
26	لدى المؤسسة القدرة على القيام بطلبات شراء منفصلة حسب الحاجة وبالكلفة نفسها					
27	غالبا ما يمكن عمل تغيير في جداول استلام المواد حسب الحاجة					
28	غالبا ما تستطيع وحدة المشتريات تجميع الطلبيات من مصادر متعددة					
29	غالبا ما يمكن تعديل حجم الطلبية وبدون كلفة إضافية					
30	غالبا ما تستطيع وحدة المشتريات تعديل موعد استلام المواد بما يتلاءم مع الحاجة لها					

*** مرونة العملية الإنتاجية:**

		غير موافق بشدة	غير موافق	محايد	أوافق	أوافق بشدة
31	لا تملك المؤسسة منشآت انتاج متعددة موجودة في مواقع مختلفة					
32	الطاقة الانتاجية الكلية كافية لاستيعاب زيادة كبيرة نسبيا في الطلب					
33	من السهل على المؤسسة تغطية النقص من الخارج اذا كان حجم الطلب الكلي أكبر من الطاقة (القدرة) الانتاجية للمؤسسة					
34	الموارد البشرية متوفرة (العمل الاضافي و/أو التعيين والتسريح المؤقت) لمعالجة التغير قصير الامد في الطلب					
35	معظم الموظفين يملكون مهارات متعددة (يمكن نقلهم بسهولة من مهمة الى أخرى)					
36	معظم الماكنات متعددة الوظائف (يمكن استخدامها لانجاز مهمات/أعمال متعددة)					
37	يمكن تأجيل تحضير المنتجات بصورها النهائية لحين تحديد طبيعة طلبيات العملاء					
38	يمكن انتاج كميات صغيرة بكلفة اقتصادية لأن إعداد المنتج لايحتاج إلى زمن طويل					
39	لدى المؤسسة طرق بديلة لانتاج المنتج					
40	نظام التخطيط يسمح للمسؤول التغيير في جدول الانتاج بسهولة					
41	الكلفة المترتبة على تغيير جدول الانتاج منخفضة لذا من الممكن طلب أي تغيير في جدول الانتاج خلال مدة زمنية قصيرة					
42	النظام دائما قادر على التكيف مع التقلب في مستوى الناتج الكلي					
43	المؤسسة دائما قادرة على الاحتفاظ بمنتجات مختلفة					
44	دائما الامكانية متاحة لانتاج أصناف متنوعة كثيرة بكميات قليلة وبشكل اقتصادي					
45	دائما يمكن تحويل عملية انتاج أي منتج الى خطوط انتاج أخرى وفي مناطق متعددة					
46	يقوم الموظفون بواجبات متعددة من أجل التكيف مع التغيير في جدول الانتاج					
47	الوقت اللازم لانتاج مزيج من المنتجات الجديدة دائما يكون حسب الوقت المحدد					

*** مرونة الدعم اللوجستي:**

		غير موافق بشدة	غير موافق	محايد	أوافق	أوافق بشدة
48	تملك المؤسسة وسائل نقل متعددة لتسليم المنتجات الى العميل					
49	من السهل فنيا أن تحوي الشحنة المرسلة/المستلمة خليطا من المنتجات					
50	يمكن تسليم كميات صغيرة من المنتجات للعملاء					
51	لا يوجد محددات تشترط أن تكون البضاعة المرسلة حاوية كاملة أو شحنة منفصلة					
52	يمكن استخدام وسائل نقل أسرع من المعتاد في حال وجود طلبيات مستعجلة					
53	يمكن تلبية طلب واحد للزبون من أكثر من مستودع أو مصنع واحد					
54	غالبا ما يكون جدول تسليم البضاعة ذا زمن قصير.					
55	غالبا ما تكون الكلفة المترتبة على احداث تغيير في موعد استحقاق تسليم البضاعة قليلة					
56	دائما ما يمكن تحديد مشاكل الشحن					
57	دائما ما يكون زمن التلبية لتحميل وشحن المواد قصيرا					
58	يوجد قنوات متعددة تمكن الزبون من شراء المنتجات ليحصل عليها مثل الانترنت وغيرها					
59	من الممكن دائما تغيير مسار تسليم البضاعة بأكمله استجابة لمتطلبات العميل					

60	يمكن تلبية طلب الزبون بسرعة عن طريق تحويل الشحنات من مكان لآخر					
61	غالبا ما يكون الزمن بين استلام طلب الزبون وتسليمه البضاعة متغيرا					
62	يمكن نقل مواد متعددة من خلال مسارات تسليم البضاعة المختلفة					
63	يوجد وسطاء شحن متعددين لكل وسيلة تسليم بضاعة					

*** مرونة تطوير المنتج:**

		غير موافق بشدة	غير موافق	محايد	أوافق	أوافق بشدة
64	غالبا ما يمكن تعيين مطورين جدد لمشروع تم تسريعه بناءا على تنبؤات بزيادة في طلبات الزبائن					
65	غالبا ما يمكن تقديم منتجات جديدة استجابة لتغيرات في توقعات الزبائن					
66	غالبا ما تستخدم المؤسسة طريقة التصميم التركيبية(Modular Design) (تستخدم عدة نماذج في المنتج نفسه بتراكيب مختلفة) في عملية تطوير المنتج.					
67	غالبا ما يكون زمن دورة التطوير للمنتج قليلا					
68	غالبا ما تكون القدرة على تقديم منتجات جديدة للسوق كبيرة					
69	المؤسسة لديها امكانية لتطوير أكثر من منتج في مدة زمنية واحدة					
70	دائما ما يعاد استخدام الأدوات والأجهزة المستخدمة في عملية التطوير للمنتجات					
71	غالبا ما تكون التغييرات التي تحدث خلال المشروع بأكمله قليلة					
72	حجم المعرفة التي يستفاد منها من مشروع ما لتصميم مشروع آخر تكون عالية					
73	غالبا ما تكون نسبة الاجزاء المشتركة المستخدمة في تصميم المنتجات تكون عالية					
74	دائما ما تستفيد المؤسسة من التكنولوجيا المستخدمة في التصنيع مثل CAD (Computer Aided Design) , CAM(Computer Aided Manufacturing)					
75	غالبا ما يتم تصميم منتجات بمواصفات متباينة بما يتناسب مع طلبات الزبون حسب الموقع الجغرافي					
76	إذا احتاج تصميم جديد لمادة جديدة، فمن السهولة ايجاد مصدر موثوق يملك القدرة على تزويد المواد الجديدة					
77	إذا تم تطوير المنتج من قبل جهة خارجية غالبا ما تكون الكلفة معتدلة					
78	لدى فريق التطوير القدرة على تطوير منتجات متنوعة وبمواصفات مختلفة					
79	يستخدم فريق التطوير برامج الحاسوب ومصادر أخرى والتي تمكنه من القيام بإختراع وتعديل ومحاكاة التصاميم					
80	إذا تم تصميم المنتج بالتعاون بين فريق موجود في مناطق جغرافية مختلفة فإنه يمتلك التقنية التي تمكنه بسهولة تبادل الأفكار وملفات التصميم،... إلخ					
81	لدى فريق التطوير القدرة على تطوير عدد كبير من التصاميم المختلفة من نماذج قياسية متعددة					
82	غالبا ما يستطيع المصممون تعديل تصميم المنتج الحالي بما يتناسب مع السوق العالمي					

*** مرونة تكنولوجيا المعلومات:**

		غير موافق بشدة	غير موافق	محايد	أوافق	أوافق بشدة
83	نظم تكنولوجيا المعلومات الموحدة تستخدم في عمليات تطوير المنتج في سلسلة التزويد المتكاملة					
84	نظم تكنولوجيا المعلومات الموحدة تستخدم في عمليات الشراء في سلسلة التزويد المتكاملة					
85	نظم تكنولوجيا المعلومات الموحدة تستخدم في عمليات الإنتاج في سلسلة التزويد المتكاملة					
86	نظم تكنولوجيا المعلومات الموحدة تستخدم في عمليات الدعم اللوجستي في سلسلة التزويد المتكاملة					
87	جميع العمليات في المؤسسة تتم من خلال نظم تكنولوجيا المعلومات					
88	تدعم نظم تكنولوجيا المعلومات عملية تطوير المنتجات الجديدة في سلسلة التزويد المتكاملة					
89	تدعم نظم تكنولوجيا المعلومات التعامل مع مزودين من جميع أنحاء العالم					
90	تدعم نظم تكنولوجيا المعلومات إيجاد قنوات توزيع عالمية جديدة					
91	تدعم نظم تكنولوجيا المعلومات ربط الأنظمة المختلفة في المؤسسة					
92	تستخدم المؤسسة نظام تبادل البيانات إلكترونيا (EDI-Electronic Data Interchange) لنقل المعلومات في سلسلة التزويد المتكاملة					
93	أنظمة إدارة التخزين المستخدمة في سلسلة التزويد المتكاملة تكون موحدة					
94	تستخدم أنظمة مراقبة الكترونية لمتابعة تسليم البضائع					
95	تستخدم أنظمة (CAM/CAD) موحدة في سلسلة التزويد المتكاملة					
96	تستخدم تطبيقات تواصل فرق العمل (Groupware) لدعم عملية تصميم المنتج					
97	تتيح نظم تكنولوجيا المعلومات تصنيع أجزاء مختلفة من المنتج في أماكن مختلفة					
98	تساعد نظم تكنولوجيا المعلومات في عملية التوافق السريع لشبكة التوزيع/الدعم اللوجستي للمؤسسة					

استكشاف مدى تطبيق نظام سلسلة التزويد المتكاملة
دراسة ميدانية على كبرى المؤسسات في عمان

سليمان خالد عبيدات وأسامة جميل كنعان *

ملخص

تمثل سلسلة التزويد المتكاملة المثالية، تكامل عمليات المنظمة الداخلية الخارجية على المستويين الاستراتيجي والمادي مع جميع أعضاء الشبكة، وذلك لتحقيق الأداء المرجو وزيادة رقي المنظمة.

تهدف هذه الدراسة إلى استكشاف مدى تطبيق سلسلة التزويد المتكاملة في السوق الأردني، بوصفها أداة تعطي ميزة تنافسية في السوق العالمي الجديد. ولتحقيق هذا الهدف، ركزت الدراسة على أبعاد المرونة للمنظمة بوصفها عاملاً تكاملياً ممكناً، وهي مرونة التوريد، ومرونة الإنتاج، ومرونة الدعم اللوجستي، ومرونة تطوير المنتج، وكذلك مرونة تكنولوجيا المعلومات، التي تستخدم عاملاً داعماً لكل أبعاد المرونة الأخرى.

ولدراسة العلاقة بين مدى تطبيق سلسلة التزويد المتكاملة وأبعاد المرونة وكذلك الفروق في تطبيق هذه الأبعاد والعائدة للعوامل المستقلة، تم تصميم وتوزيع الاستبانة على كبرى الشركات في عمّان– الأردن، التي تعمل في قطاعات الصناعة والخدمات والبيع المجزأ. هذا وقد شمل المسح الميداني اثنتين وخمسين شركة تعمل إداراتها داخل عمّان وهي من الشركات التي يزيد رأس مالها على عشرة ملايين دينار أردني، وقد تبقى منها اثنتان وأربعون استجابة تصلح لتحليل البيانات.

أثبتت نتائج الدراسة أن إمكانية تطبيق سلسلة التزويد المتكاملة في السوق الأردني متوفرة، وأن هناك علاقة بين مدى تطبيق سلسلة التزويد المتكاملة و محددات مرونة المنظمة، وهو ما يتوافق مع نتائج الدراسات السابقة، كذلك أثبتت الدراسة أن هناك فروقا بين الشركات في إمكانية تطبيق سلسلة التزويد المتكاملة عائدة لمرونة تكنولوجيا المعلومات. لقد وجد أن أقوى عامل مرونة مؤثر هو مرونة الدعم اللوجستي، ومن ناحية أخرى أثبتت الدراسة أنه لا يوجد علاقة بين مرونة الإنتاج ومدى تطبيق سلسلة التزويد المتكاملة في السوق الأردني وهو ما لا يتوافق مع نتائج الدراسات السابقة. لقد بينت نتائج الدراسة أنه كلما زادت مرونة المنظمة كان إمكان تطبيق سلسلة التزويد المتكاملة أعلى ويكون أداء المنظمة أفضل.

يوصي الباحثان بأن تقيم المنظمات علاقة شراكة مع أطراف السلسلة الأخرى وذلك من خلال اتفاقيات طويلة الأمد وبعد تطبيق نظام تقييم شامل ومانع، كذلك تمت التوصية بأن تحرص الشركات على استخدام موارد متعددة الأغراض والوظائف سواء فيما يخص الماكنات أو الموارد البشرية.

الكلمات الدالة: التطبيق، سلسلة التزويد المتكاملة، المرونة، تكنولوجيا المعلومات.

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