

## SUPPLY CHAIN INTEGRATION AND PERFORMANCE: THE IMPACT OF IRANIAN PHARMACEUTICAL INDUSTRIES, THE CASE STUDY

Hossein Vatanpour<sup>1\*</sup>, Atoosa Khorramnia<sup>2</sup>, Tannaz Bovand<sup>3</sup>

1. *Pharmacoeconomy and Pharmacy Management Dep., Pharmacy School, Medi. Sci. University Shahid Beheshti, Tehran-Iran.*
2. *Pharmaceutical Sciences Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran.*
3. *Department of Pharmacology & Toxicology, Faculty of Pharmacy, Pharmaceutical Sciences Branch, Islamic Azad University, Tehran - Iran (IAUPS).*

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### ABSTRACT

Aims: the purpose of this survey is to inspect internal supply chain factors that they effected on integration supply chain practice and inspecting impression level of supply chain integration on supply chain performance in Iranian pharmaceutical supply chain. Method: the basic fundamentals of supply chain management is coordination and integration forming. Eventually supply chain integration requires the coordination and cooperation of all sectors of the pharmaceutical supply chain, including suppliers, consumers, retail and wholesaler. Considering the importance of supply chain integration to evaluate the integrity of the supply chain grouped the factors affecting coordination under 6 factor such as "mutual understanding", "management commitment", "information sharing", "risk and reward sharing", "Communication and shared decision-making", "Organizational Structure". Finally, we study their impact on financial performance. Questionnaires were distributed to the managers of pharmaceutical companies; 181 answered the questions. Then the results were transferred to SPSS analysis software carefully. Descriptive statistics, mean, Cronbach's alphabet questionnaire, Friedman test, Pearson correlation coefficient test, Kaiser-Mayer-Olkin and regression test is performed in order to acquire the results. Results: The results show that the pharmaceutical companies are committed to the following factor, respectively: mutual understanding, management commitment, information sharing, risk and reward sharing, Communication and shared decision-making, Organizational Structure. The results show that, organizational structure and management commitment have positive and direct effect on ROI (Return on Investment), operating profit, ROA (Return on Assets). Also organizational structure has positive and direct effect on the Economic Value Added and Exports. Originality/ Value- this survey's efforts to reveal how potential benefits of integration Iranian pharmaceutical supply chain can no longer paid no attention.

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### Introduction

Pharmaceutical companies are undergoing major changes to cope with the new challenges of the modern economy, the globalization of business, diversity and complexity of new drugs, increasing tightness of capital, and diminishing protection provided by patents are some of the factors driving these changes. All stages of the business value chain are affected from the development of new drugs to the management of the manufacturing and marketing networks. Market pressures are also forcing pharmaceutical companies to take a more holistic view of their businesses and product portfolios. Nowadays the typical life cycles of new drugs are becoming shorter. It may take 8 years to develop a new product, and the investment on it must be recovered quickly because generic equivalents can appear later in the market thus reducing its profitability.

**Corresponding Author:** Hossein Vatanpour, Pharmacoeconomy and Pharmacy Management Dep., Pharmacy School, Medi. Sci. University Shahid Beheshti, Tehran-Iran.

Companies are constantly faced with the question what is the best strategy to overcome and win in this aggressive and competitive market environment.

Over the past decade, one of the main themes in the supply chain management literature has been integration as a key factor in achieving improvements [1, 2]. In so many recent publish the authors explain that integrative practices and high level of integration within a supply chain partner have a positive impact on corporate and supply chain performance. Integration has been the core of logistics and supply chain management since the 1980s. It is an important topic both for business management staff and for researchers because it is considered to be a source of improvement for corporate and supply chain performance as well as competitive advantage [3].

For years the relationship between integration and performance has been widely discussed and supported, from both the theoretical [4, 5].

The benefit of an integrated supply chain can be attained through efficient linkages among various parts supply chain activities, and the linkage should be subject to the effective construction and utilization of various supply chain practices for an integrated supply chain. This means that if a firm is pursuing the effective construction of SCM practices needs to pay attention to SC integration [6]. SCM practices implemented to achieve superior supply chain performance require internal cross-functional integration within a firm and external integration with suppliers or customers to be successful [7]. That is, functional integration and early internal integration stages emphasize capabilities for cost reduction rather than balanced performance improvement, while later internal integration and external integration stages are characterized by capabilities enabling the supply of high quality products shipped direct to the line on time through full systems visibility from distribution to purchasing, and complete information sharing and long-term commitment with key partners [6]. The pharmaceutical industry can be defined as a complex of processes, operations and organizations involved in the discovery, development and manufacture of drugs and medications.

The World Health Organization (WHO) defines a drug or pharmaceutical preparation as any substance or mixture of substances manufactured, sold, offered for sale or represented for use in the diagnosis, treatment, mitigation or prevention of disease, abnormal physical state or the symptoms thereof in man or animal; [and for use in] restoring, correcting or modifying organic functions in man or animal.

This is a very wide definition, and correspondingly, there are number of key players in the pharmaceutical industry, including:

- (i) The large, research and development-based multinationals with a global presence in branded products, both ethical/prescription and over-the-counter. They tend to have manufacturing sites in many locations.
- (ii) The large generic manufacturers, who produce out-of-patent ethical products and over-the-counter products.
- (iii) Local manufacturing companies that operate in their home country, producing both generic products and branded products under license or contract.
- (iv) Contract manufacturers, who do not have their own product portfolio, but produce either key intermediates, active ingredients (AI) or even final products by providing outsourcing services to other companies.
- (v) Drug discovery and biotechnology companies, often relatively new start-ups with no significant manufacturing capacity [8].

The purpose of this research is to disclose the interrelationships among the above-mentioned two SCM practice issue, the level of SC integration and influence them on performance. This is helpful in developing a substructure for linking a component's SC integration strategy in identifying how such linkage can be connected to the change for the better of organizational performance. Such effort also should enable us to derive a set of advisable utilization strategies of SCM practices for SC integration [6].

The goals of the pharmaceutical supply chain obviously emphasize regulatory compliance and safety of products, but also include leveraging information to be more responsive to the needs of consumers. The unique nature of the supply chain for pharmaceuticals makes managing complex information for supply chain effectiveness challenging, but clearly the rewards for doing so are significant. Companies that excel in supply chain operations perform better in almost every financial measure of success. According to AMR Research, supply chain excellence that improves demand-forecast accuracy leads to 5% higher profit margins, 15% less inventory, up to 17% stronger "perfect order" ratings, and 35% shorter cash-to-cash cycle times. This also will helpful to improve in developing a flexible SC structure for linking a pharmaceutical firm's SC integration strategy to identifying how such linkage can be connected to the improvement of SC performance and it should enable us to derive a set of advisable utilization strategies of SCM practices for SC integration. In this research the author constructs and methodologies to better understand the relationship between supply chain integration and performance pharmaceutical industry in Iran.

## Literature Review

### Supply Chain Integration

The literature and state that the variety of supply chain management and integration definitions is large [1, 9].

The purpose of supply chain management is described by [10] as to being to “remove communication barriers and eliminate redundancies” through coordinating, monitoring and controlling processes. The integration of supply chains has been described by Clancy as:

attempting to elevate the linkages within each component of the chain, (to facilitate) better decision making [and] to get all the pieces of the chain to interact in a more efficient way [and thus]. create supply chain visibility [and] identify bottlenecks [11].

The main drivers of integration are listed by Handfield and Nichols (1999) [12] as:

- The information revolution;
- Increased levels of global competition creating a more demanding customer and demand driven markets; and
- The emergence of new types of inter-organizational relationships.

They describe the three principal elements of an integrated supply chain model as being information systems (management of information and financial flows), inventory management (management of product and material flows), and supply chain relationships (management of relationships between trading partners) [13].

The basis of integration can therefore be characterized by cooperation, collaboration, information sharing, trust, partnerships, shared technology, and a fundamental shift away from managing individual functional processes, to managing integrated chains of processes [14]. The extent of integration can begin with product design, and incorporate all steps leading to the ultimate sale of the item [15].

The most important benefits a firm can achieve through integration; it is better information linkages with its supply chain (SC) members. These benefits include shorter lead-times, smaller batch sizes, reduced inventory levels, faster new product design, shorter order fulfillment cycles, improved coordination in supply chain activities, and improved purchasing, operations, and firm performance [16-23].

Supply chain management (SCM) has emerged as a product of the modern information Revolution [24]. Advances in information technology (IT) have enabled the coordination and collaboration that underlie today’s SCM strategies [25, 26].

SCM researches has explained the benefits a firm can gain through better information linkages with its supply chain (SC) members. These benefits can be such as shorter lead-times, smaller batch sizes, reduced inventory levels, faster new product design, shorter order fulfillment cycles, improved coordination in supply chain activities, and improved purchasing, operations, and firm performance [17-19, 22, 23].

Effective of inappropriate information sharing to the integration of supply chain activities has direct the effect of increasing the levels of complexity to managing supply chain. Two type of complexity, detail and dynamic.

Detail complexity exists when there are many variables needing to be managed. Dynamic complexity exists where cause and effect are separated, and difficult to associate, in both time and space: situations where cause and effect are subtle and effects over time of interventions are not obvious. Conventional forecasting, planning and analysis methods are not equipped to deal with dynamic complexity. The “bullwhip effect” is an example of a typical supply chain management outcome resulting from circumstances that are dynamically complex, and was first highlighted by [5]. have defined this effect thus: This phenomenon states that the demand process seen by a given stage of a supply chain becomes more variable as we move up the supply chain (i.e. as one move away from customer demand). In other words, the orders seen by the upstream stages of a supply chain are more variable than the orders seen by the downstream stages [23].

Attributions of causes for the bullwhip effect have varied since it was first observed. The behaviour in the system is a function of the interaction of structure (“effective organization structure and information sources”), delays (time between cause and effect/decision and implementation, etc.), and amplification (the inherent effects of policies) [5].

The primary influences as being irrational human behavior driven by a misunderstanding of real demand [27]. Lee et al. (1997) believe that the problem lies in the infrastructure of the supply chain itself, identifying practices such as demand forecast updating, order batching, price fluctuation and rationing and shortage gaming as the key drivers [18].

In this research the authors express a main hypothesis and six sub-hypotheses that those sub-hypotheses are consisted of sub-hypothesis too.

#### **H1. The level of sharing information practices has a positive effect on the level of SC integration.**

Lack of information visibility along the supply chain is a common supply chain process integration problem. In a 2002 survey, two-thirds of manufacturers had not yet successfully synchronized their supply chain operations with those of their trading partners [9].

In the absence of supply chain visibility, trading partners have to carve out data from their ERP (enterprise resource planning) or legacy systems and then send it to one another where it then has to be uploaded to other systems prior to the data being shared and evaluated, the time lost can mean lost end customers and higher costs through the supply chain membership [28]. Organizational theory can help us understand how company culture influences whether or not the people within a firm will be willing to share information [29-31].

Despite the fact that IT allows the members of supply chain be connected and so they are able to sharing information, but it does not mean the people involved in taking decision they also share openly information. In fact, some decision makers might perceive that sharing information in inappropriate time or they receive distorted information, because they might worry that other members in the supply chain may use sensitive information opportunistically.

They thus withhold information regarding inventory levels, sales forecasts, technology roadmaps, market entry plans, and product development that could help SC partners improve their operations as well as the performance of the relationship [24].

The variability increases in moving up the supply chain from consumer to grocery store to distribution center to central warehouse to factory is known the bullwhip effect. The bullwhip effect is one of interrupting effect that it happens in SC because of lack information flow.

#### **Activities causing the bullwhip effect**

- Demand updating
- Order Batching
- Price Fluctuations
- Rationing and Shortage

Identified four major causes of bull whip effect, these causes and methods used to counteract them will be discussed in this section for the purpose of getting deep understanding of this obstacle to process integration along the supply chain [18]. As lead time grows between orders placed and deliveries, then the safety stock also grow and are included in any order as they pass up the supply chain [32].

Thus, fluctuations are magnified as orders vary from period to period but along that the frequent demand forecasting not updating. One solution to this problem is to make actual demand data available to the firm's suppliers [28].

In a typical buyer/supplier scenario, demand draws down inventory until a reorder point is reached wherein the buyer places an order with the supplier. Inventory levels, safety stocks, and the desire to order full truckloads or containers loads of materials may cause orders to be placed monthly or even less often, or at a varying time intervals. This type of order batching amplifies demand variability and adds to a bullwhip effect. Another type of order batching can occur when sales people need to fill end-of-quarter or end-of-year sales quotas, or when buyers desire to finish year-end budget allotments [28]. Thus the solution should be forecast updating; information visibility and use of more frequent and smaller order sizes will tend to reduce the order batching problem.

The other causing bullwhip effect, when suppliers have special promotions, quantity discounts, or other special price discounts, these price fluctuations results in significant forward buying activities on the part of buyers, who are stocking up to take advantage of low price offers. Forward buying occurs between retailers and consumers, between distributors and retailers, and between manufacturers and distributors due to pricing promotions at each stage of the supply chain, all contributing to erratic buying patterns and, consequently, the bullwhip effect [28].

Rationing occurs when demand exceeds a supplier's finished goods available; and, in this case, the supplier may allocate product in proportion to what buyers ordered. Thus, if the supply of goods is 75 percent of the total demand; buyers would be allocated 75 percent of what they ordered. When buyers figure out the relationship between their orders and what is supplied, they tend to inflate their orders to satisfy their real needs [33]. This strategy is termed as shortage gaming. Obviously, this further escalates the supply problem, as the supplier struggle to keep up with these higher demand levels. When, on the other hand, production capacity eventually equals demand and orders are filled completely, demand suddenly drops to less-than-realistic levels, as the buying firms try to unload their excess inventories.

A number of rational decisions on the part of buyers and suppliers tend to cause the bullwhip effect. When trading partners use the preceding strategies to reduce the bullwhip effect, the growth of information sharing, collaboration, and process integration occurs along the supply chain. Firms that strive to share data, forecasts, plans, and other information can significantly reduce the bullwhip effect.

#### **H2. The level of agreement on supply chain vision & focus has a positive influence on the level of SC integration.**

Most important requirement to integration between the supply chain members, it is trust. As the pervious researches express the most important factors that they confuse the supply chain integration, they are silo mentality and lack of information visibility. Hence trust is seen as the major stumbling block in supply chain management. Trust occurs over time between supply chain partners, as each participant earns trust while it builds its reputations among the other businesses.

Even though this sounds impossible, relationships employing trust result in win-win or win-win-win for the participants. Here is example; Spalding Holding collaborates with Wal-Mart, resulting in win-win for both companies. Wal-Mart gives Spalding its forecast and point-of-sale data, which allows Spalding to keep its inventory levels down and serve Wal-Mart's needs better. As a result, Wal-Mart stocks out of Spalding goods less frequently and it now has a better understanding of Spalding's capacity and cost [34].

Unfortunately, company practices and human nature will not change overnight. Until parties understand that it is in their own best interest to trust each other and share information, supply chain management success will be an uphill battle. For example, Boeing has been running against a trust barrier with some of its suppliers. Boeing engineers and their suppliers pass design documents back and forth as if they were in the same company. The technology that allows this is causing trust problems for Boeing. The company has been suspecting its suppliers to pass technology to their close competitors [25].

The supply chain processes that need to be managed and integrated for successful supply chain management are identified and described. Then, achieving cross-functional and cross-firm involvement using the supply chain management processes is addressed. Next, the essential linkages required to facilitate the integration of supply chain members, the customer

relationship management (CRM) and supplier relationship management (SRM) processes, are explained. The remaining six processes are coordinated through the CRM and SRM linkages. Each process should be evaluated based on its contribution to overall financial performance and a method for measuring this contribution is presented.

**H3. The level of organizational structure compatibility directly and positively contributes to the level of SC integration.**

As companies which they are working as a supply chain, they toward integrating their internal functions and begin to understand the workings as an integrated largersystem to which they belong, they begin to generate clearer understanding of the scope of supply chain integration. A number of factors can impede external process integration along the supply chain, causing information distortion, longer cycle times, stock-outs, and bullwhip effect, resulting in higher overall cost and reduced customer service capabilities [28]. Nowadays companies have been moving toward collaboration and process integration, technology improvement has caught up with this vision and allowing the process integration across an extended supply chain is faster. In a survey of 122 executives practicing supply chain management, 43 percent said lack of core supply chain management skills and knowledge was the greatest obstacle within their own organizations, and 54 percent echoed this opinion for their trading partners. Getting the network of firms to work together successfully, though, requires managers to use subtle persuasion and education to get their own firm and their trading partners to do the right things [28].

Organizational theory can help us understand how company culture influences whether or not the people within a firm will be willing to share information [29-31]. Company culture influences both how willing people are to share information within a firm as well as with SC members outside the firm. In fact, each organizational unit within a firm may have a different attitude when it comes to sharing information [35]. The other hand some member of supply chain may feel change and information sharing can be threatening to them; they may fear for their job security, particularly if outsourcing accompanies integration. Thus, firms must realize that the people to be using the system must be involved decision making, for entire supply chain. For all organizations, successful supply chain management requires a regiment of ongoing training. When education and training are curtailed, innovation cannot occur, and innovation fuels supply chain competitiveness [34].

**H4. The levels of Share Risk & Rewards have positive influence on the level of integration.**

The range benefits that can accrue to companies that are able effectively manage and work in their supply chains includes:

- Increased market share and sales growth
- Reduced inventory levels
- Reduced SCM costs
- Decreased order cycle/fulfillment time
- Increased asset and capital utilization
- Improved delivery performance
- Flexibility in meeting/responding to customer requirements
- Improved return on assets and sales
- Increased forecast accuracy
- Reduced cash-to-cash cycle time

Revenue growth fueled by increased responsiveness occurring at lower cost using fewer assets translates into stellar performance. As the demands of customers and stakeholders increase, and global competition grows, supply chain management, when properly implemented, obviously has the capability to deliver improvements across multiple dimensions of performance [28].

**H5. The levels of Top-management support and commitment have positive effect on the level of integration.**

In many instances, the chief executive in supply chain have to consider the impact of their decisions and actions on the supply chain performance, thus their decision should be for long-term competitiveness and profitability for supply chain performance. According to Wisner et al (2006), the "I win, you lose" silo mentality manifests itself in the form of using cheaper suppliers, paying little attention to the needs of customers, and assigning few resources to new products and service design [34].

Eventually, these firms will create quality, cost, delivery timing, and other customer service problems that are detrimental to the supply chain [32].

Internally, the silo effect can also be present among top-manager of departments. The transportation manager for instance, may be trying to minimize total annual transportation costs while inadvertently causing safety stocks to be higher, shortages to occur, and customer service levels to deteriorate [28].

According to Tumaini Mujuni Katunzi, 2011, to overcome the silo mentality, the firm must strive to align supply chain goals and the goals and incentives of the firm. Functional decisions must be made while considering the impact on the entire firm's profit and those of the supply chain. Performance reviews of managers must include their ability to integrate processes internally and externally and to meet the overall supply chain goals [28].

**H6. The level of cooperation and coordination within the partners of a SC has positive influence on the level of integration.**

A firm needs to develop effective coordination within and beyond its boundaries in order to maximize the potential for converting competitive advantage into profitability [3]. The quality of the state of collaboration that exists among

departments that is required to achieve unity of effort by the demands of the environment [35]. A coordination within independent partners of a SC, such as raw-material suppliers, manufacturers, distributors, 3PL providers and retailers, is the key to accomplishing the flexibility which it help them to progressively improve their functions processes in to fulfill customers and to response to the environment changes. An appropriate coordination among the supply chain partner can improve the entire SC performance. Some of negative consequences of poor coordination include higher inventory costs, longer delivery times, higher transportation costs, higher levels of loss and damages, and lowered customer service [18].

#### **H7. The level of SC integration has directly and positively contributes to increasing the firm performance.**

Supply chain can't improve own productivity individually, asserted that, for effective SCM, comprehensive efforts for improvement in all of supply chain functions within a firm should be made, and, first of all, the focus of supply chain practices should shift from functional and independent to general and integrative.

the process of SC integration should progress from the integration of internal logistics processes to external integration with suppliers and customers. This internal integration can be accomplished by the automation and standardization of each internal logistics function, the introduction of new technology, and continuous performance control under formalized and centralized organizational structure. External integration can be achieved by information sharing and strategic linkage with suppliers and customers, and the standardization of logistics process between firms [36].

Supply chain management is the integration of key business processes from end-user through original suppliers that provides products, services, and information that add value for customers and other stakeholders (The Global Supply Chain Forum,).

One of the most significant paradigm shifts of modern business management is that individual businesses no longer compete as solely autonomous entities, but rather within supply chains. In this emerging competitive environment, the ultimate success of the business will depend on management's ability to integrate the company's intricate network of business relationships. (Drucker, Peter F) The members of a Supply Chain Forum refer to the management of a network of relationships as supply chain management. Successful supply chain management requires cross-functional integration within the firm individually and across the network of firms that comprise the supply chain. It is focused on relationship management and the improvements in performance that result from better management of key relationships. However, in many companies executives struggle to achieve the necessary integration. By understanding the supply chain management processes and how they should be implemented, executives will be able to create more integrated supply chains which will lead to higher revenues and increased profitability and better performance for all member firms.

The previous research the high levels of supply chain performance take place when the strategies at each of the firms perfectly fit with on the whole supply chain strategies. Hence, each firm of whole of supply chain must understand own role in the supply chain, the needs of the ultimate customer, the needs of its immediate customers, and either how these needs translate into internal operations requirements or the requirements being placed on suppliers. Once these needs and the products and services themselves can be communicated and transported through the supply chain effectively, successful supply chain management and its associated benefits will be realized.

Successful supply chain integration occurs when the participants realize that supply chain management must become part of all of the firms' strategic planning process, in which objectives and policies are jointly determined based on the final customer's needs and what the supply chain as a whole does well [34].

The literature review above described leads to the development of the proposed six construct variables; SC integration, SCM practices, firm performance. Structural equation modeling technique was used to investigate the interrelationships among the six construct variables and the firm performance.

## **Research Methodology**

### **Sampling**

The potential benefits of integrating supply chain can no longer be ignored [6]. This research considers the coordination and integration of supply chain affect on supply chain performance. Consistent with the purpose of this study, the integration forming the basic fundamentals supply chain were sampled. This integration requires the coordination and cooperation of all sectors of the pharmaceutical supply chain, including suppliers, consumers, retailers and wholesalers.

Thus in this paper for measure coordination and cooperation within supply chain, the researcher considered the level of sharing information, agree on supply chain vision & focus, organizational structure compatibility, Share Risk & Rewards, Top-management support and commitment, cooperation and coordination within the partners of SC Iranian pharmaceutical industry has positive influence on the level of SC integration, in consequence Supply chain performance.

The pharmaceutical business environment continues to develop at a rapid rate. Increasing interactions between economies, particularly in Asia, has raised many important issues regarding integration supply chain (SC) and supply chain management (SCM). The important benefits of integration supply chain can't consider any more. The goals of the pharmaceutical supply chain is the means through which prescription medicines are delivered to patients and obviously emphasize regulatory compliance and safety of products, include leveraging good information flow and consolidation relationship between different part of supply chain make it more responsive to the needs of end consumers.

This potential, however, will be realized only if the connections and inter-relationships among different parts of the supply chain are recognized, and proper alignment is ensured between the design and execution of the company's competitive

strategy. This study is an effort to consider how the situation of Iranian supply chain pharmaceutical companies' integration through linking SCM practices effect on SC performance.

The Pharmaceuticals originate in manufacturing sites; are transferred to wholesale distributors; stocked at retail, mail-order, and other types of pharmacies and there are many variations on this basic structure, as the players in the supply chain are constantly evolving, and commercial relationships vary considerably by geography, type of medication, and other factors.

The data for this research were collected through Library method, studying the previous article, thesis, books, journals local and international research and in Field method questionnaires were designed in LIKERT five SCALE. In order to raise questionnaires reliability of measurement were transferred and the internal consistency of each dimension is assessed by computing the Cronbach's alpha, composite reliability and average variance extracted.

The designed questionnaires have sent to five medium size pharmaceutical companies industry. The data was being collected within two years and the financial data of those five medium size Iranian pharmaceutical companies was being deliberated 2004 to 2014. The level position of respondents were mainly top-managers, senior executive managers and pharmaceutical Iranian supply chain managers, but in cases where a separate organizational entity for SCM didn't exist, response was requested from top-level pharmaceutical executive and pharmaceutical Syndicate top-managers executive of sales, production, or planning department who was accountable for well acquainted with supply chain schedule planning and corporate and coordinate strategies of the Supply chain. Almost 181 candidates have responded to questionnaires that 181(75 female, 100 male) they 55.2% male and 41.4% female have answered to this research questionnaires. The variance distribution levels of education's candidate were bachelor's degree to medical profession PhD degree. The questionnaires were transmitted by individual visit, fax, and mail to Iranian pharmaceutical companies.

In this survey have considered the five Iranian pharmaceutical companies financial data due to their financial statements and those factors supposed were effected on supply chain integration respectively they are "Information Sharing" ",Mutual Understanding", "Organizational Structure" , "Risk and Reward Sharing", "Management Commitment " and "Communication" and shared decision-making" and the financial factors respectively were " Return on Equity" , "Operational Profit", "Export" , "Return on Assets" ,"Earnings Per Share" ,"Economic Value Added". After data collected for inspection reliability of those data, they were checked by Cronbach's alpha test. Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability. A "high" value for alpha does not imply that the measure is unidimensional. Cronbach's alpha be equal zero, it means unreliability of question and more than zero or equal +1 reveal the reliability of questionnaire. In this study Cronbach's alpha computes by SSPS program for whole questions of questionnaire were equaled 0.93, thus it proved all questions and questionnaire were reliable and completely appropriate for this study.

**Table 8.** Candidate Frequency Distribution by Age

Age		Observed Frequency	Percentage %
	25 -35 Years	95	52.5
35 -45 Years	60	33.1	
45 -55 Years	13	7.2	
55- 65 Years	6	3.3	
<b>Total</b>	181	100	

**Table 9.** Candidate Frequency Distribution by Sex

Sex		Observed frequency	Percentage %
	Female	75	41.4
Male	100	55.2	
<b>Total</b>	181	100	

**Table 10.** Candidate Frequency Distribution by Education level

Education level	Education level	Observed frequency	Percentage %
	Bachelor to Master degree	109	60.2
professorial Ph.D degree	54	29.8	
Ph.D	8	4.4	
<b>Total</b>	181	100	

The unique nature pharmaceuticals supply chain makes managing complex information and information sharing for supply chain effectiveness challenging, but clearly the rewards for doing so are significant. Pharmaceutical companies that have

more integrated supply chain; their operation performs better in almost every financial measure of success. In this paper as stated were collected data through questionnaires sent to 181 supply chain managers and top-level executives, that based upon sex differences applicant had responded, they were 4.41% (75 persons) female and 55% (100 persons) male. The based upon age range applicants had responded, they were 5.52% (95 persons) 25 -35 and 1.33% (60 persons) 35 - 45 and 2.7% (13 persons) 45 - 55 and 3.3% (6 persons) 55 - 65. So according to research result the maximum applicant numbers were responded to the questionnaires, their age were 25- 35 and the minimum applicant numbers were responded to the questionnaires, their age were 55 - 65.

Based upon education level applicants had responded, they were 2.60% (109 persons) they were magister degree level, 8.29 % (54 persons) they were professorial PhD degree and 4.4% 99 (8 persons) they were PhD degree.

Based upon the work experiences in Pharmaceutical industries' applicant, they were 17.7% (1-5 years) ,30.9% (6-10 years), 18.8% (11-15 years), 8.3% (16 -20 years), 3.3% (21-25years) and 3.9% (over 25 years). So according to research result the maximum applicant numbers were responded to the questionnaires had work experience (6 -10 years) and the minimum applicant numbers were responded to the questionnaires had long work experience (21 -25 years).

**Table 11.** Candidate Frequency Distribution by Work Experience in Pharmaceutical Industry

	Work experience	Observed frequency	Percentage %
<b>Work experience in pharmaceutical industry</b>	1 - 5 years	32	17.7
	6 – 10 years	56	30.9
	11 – 15 years	34	18.8
	16 -20 years	15	8.3
	21 -25 years	6	3.3
	Over 25 years	7	3.9
	<b>Total</b>	181	100

**Table 1.** Research Variables and Measurements Measurement Item and Method

Research variable	Measurement items
<b>Information Sharing</b>	<ul style="list-style-type: none"> <li>-The participation level of technical information sharing within supply chain members.</li> <li>-The participation level of technical information sharing (market information, product information, inventory information) within supply chain members through appropriate IT network.</li> <li>-The participation level of awareness supply chain members about short and long strategically supply chain's vision.</li> <li>- The participation level of visibility information flowing within supply chain</li> <li>-The participation level of accessing to necessity and reliance information in appropriate time</li> </ul>
<b>Mutual Perception</b>	<ul style="list-style-type: none"> <li>The participation level of consulting for improving quality of product within supply chain members</li> <li>- The participation level of accessing to good pattern model for measuring the execution activities in supply chain</li> <li>- The participation level of considering of the benefits' organization for the supply chain members in decision making.</li> <li>- The level of mutual trust within the supply chain members</li> <li>- The level of freedom for expressing supply chain members criticism</li> <li>-The participation level of supporting the supply chain member's in accidental mistake</li> <li>- The participation level of supply chain member's to acceptance about common decision making</li> </ul>
<b>Organizational Structure</b>	<ul style="list-style-type: none"> <li>- The participation level of supply chain member's changing or leaving their official positioning to more coordination supply chain</li> <li>- The level of awareness and obviousness about official members' positioning within supply chain</li> <li>- The frequency of periodical meeting the executive supply chain members for improvement supply chain</li> <li>- The level of flexibility and agility of human resource within supply chain</li> </ul>

<p><b>Sharing Risks and Benefits</b></p>	<ul style="list-style-type: none"> <li>- The participation level of sharing risks and benefits within supply chain members.</li> <li>- The participation level of supply chain members in securing and equipping supply chain</li> <li>- the participation level of covering supply chain members to environment business risks</li> <li>- The participation level of reminding top-managers to members about the advantages of the sharing benefits and risks with the other supply chain members.</li> </ul>
<p><b>Top-Management Support and Commitment</b></p>	<ul style="list-style-type: none"> <li>- The participation level of supporting the members of long-term supply chain strategy.</li> <li>- The participation level of loyalty and supporting the members of supply chain to supply chain's contract and transaction.</li> <li>- The level of giving inappropriate promise to supply chain members</li> <li>- The level of offering verity training programs by top managers to members supply chain</li> <li>- The participation level of reminding about caring long term relationship within the supply chain members to improvement supply chain performance.</li> </ul>
<p><b>Mutual Relation and Common Decision</b></p>	<ul style="list-style-type: none"> <li>- The participation level of choosing new partnership within supply chain by members.</li> <li>- The level of accessing to an appropriate system to measuring the supply chain integration.</li> <li>- The participation level of keeping the long term partnership within supply chain members.</li> <li>- The participation level of supply chain members to cooperating for common planning within supply.</li> <li>- The participation level of the supply chain members to decreasing costs.</li> <li>- The participation level of the supply chain members to lunching and developing new product.</li> </ul>

Level of supply chain management practice (five-point Likert scales: Extremely low- extremely high)

**Financial statement's five Iranian pharmaceutical companies:**

In order to research about financial Iranian pharmaceutical companies, the researcher has collected respectively data of Jaber- Ebn hayyan, Sobhan, Chemi-darou, Alborz-darouand Osvah from SEO Iran (Securities & Exchange Organization). This research considered five years financial statement duration. The below table reveals three financial factors "operational profit", "Return on Equity" and "Return on Assets". The period tense has chosen 2010 to 2014.

**Table 2.** Iranian pharmaceutical Information

Firm name	Operational Profit					Return on Equity					Return on Assets				
Time	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
Osvah	27.52	30.74	38.27	44.05	44.71	50.30	53.17	50.69	54.99	34.78	19.88	21.38	22.74	25.62	12.67
Jaber-Ebn Hayyan	21.21	23.04	26.02	38.59	-----	34.82	32.31	26.35	49.71	-----	15.99	16.00	13.57	27.05	
Chemi-darou	28.68	25.87	23.01	47,56	----	31.19	18.01	18.75	56.61	-----	11.70	5.94	5.72	28.29	-----
Alborz-darouco	34.90	37.26	37.57	45.13	42.88	48.08	44.77	41.16	57.19	33.00	21.52	20.86	18.62	31.95	14.13
Sobhan	38.63	40.65	44.47	54.40	51.69	57.29	57.34	59.49	71.93	54.93	30.00	30.12	32.00	40.91	20.31

The below table reveals other financial Iranian Pharmaceutical factors "Export", "Earnings per Share" and "Economic Value Added". The period tense has chosen 2010 to 2014.

**Table 3.** Iranian pharmaceutical Information

Firm name	Export					Earnings per share					Economic Value Added				
	2007	2008	2009	2010	2011	2007	2008	2009	2010	2011	2007	2008	2009	2010	2011
Osvah	0.42	0.26	0.72	1.05	0	1601	1785	2254	1460	1921	0.723	0.847	0.720	0.724	1.074
Jaber-Ebn Hayyan.	1.68	1.33	1.51	2.12	0	1129	1225	939	453	639	2.531	2.965	2.522	2.536	3.76
Chemi- darou	0.82	3.6	0	0	0	1027	991	936	481	259	1.205	1.883	1.601	1.61	2.387
Alborz- darou	0.84	0.46	0.24	0.28	0.18	1422	1906	2036	1615	1518	0.321	0.753	0.64	0.966	0.994

**Pearson Correlation Coefficient**

The Pearson product-moment correlation coefficient (sometimes referred to as the PPMCC or PCC or Pearson's r) is a measure of the linear correlation between two variables X and Y, giving a value between +1 and -1 inclusive, where 1 is total positive correlation, 0 is no correlation, and -1 is total negative correlation. It is widely used in the sciences as a measure of the degree of linear dependence between two variables.

**Table 4.** Pearson correlation coefficient researches variable

variables	IS	MU	OS	RRS	MC	CSD	ROE	OP	EX	ROA	EPS	EVA
IS	1	0.777	0.685	0.612	0.633	0.675	-0.179	-0.106	-0.228	-0.091	-0.121	-0.227
MU	0.777	1	0.699	0.725	0.697	0.739	-0.089	-0.017	-0.210	-0.006	0.124	-0.209
OS	0.685	0.699	1	0.684	0.652	0.720	0.035	0.087	-0.040	0.097	-0.039	-0.039
RRS	0.612	0.725	0.684	1	0.632	0.656	-0.026	0.034	-0.104	0.048	0.022	-0.102
MC	0.633	0.697	0.652	0.632	1	0.696	0.047	0.107	-0.074	0.113	0.043	-0.74
CSD	0.675	0.739	0.720	0.656	0.696	1	-0.047	0.019	-0.159	0.030	0.091	-0.159
ROE	-0.179	-0.089	0.035	-0.026	0.047	-0.047	1	0.974	0.853	0.959	-0.724	0.853
OP		-0.017	0.087	0.034	0.107	0.019	0.0974	1	0.771	0.997	-0.716	0.771
EX	-0.228	-0.210	-0.040	-0.104	-0.074	-0.159	0.853	0.771	1	0.757	-0.894	1.000
ROA	-0.091	-0.006	0.097	0.048	0.113	0.030	0.959	0.997	0.757	1	-0.724	0.758
EPS	0.121	0.124	-0.039	0.022	0.043	0.091	-0.724	-0.716	-0.894	-0.724	1	-0.896
EVA	-0.227	-0.209	-0.039	0.102	-0.074	-0.159	0.853	0.771	1.000	0.758	-0.896	1

- IS: Information Sharing
- MU: Mutual Understanding
- OS: Organizational Structure
- RRS: Risk and Reward Sharing
- MC: Management Commitment
- CSD: Communication and shared decision-making
- ROE: Return on Equity
- OP: Operational Profit
- EX: Export
- ROA: Return on Assets
- EPS: Earning Per Share
- EVA: Economic Value Added

In this research level of significance correlation was 0.01 and level of test error was 0.05, so in case the level of correlation coefficient is less than error level, it means significance correlation coefficient. The Correlation coefficient test reveals the factors "Mutual Understanding" (0.777), " Organizational Structure" (0.685), " Risk and Reward Sharing"(0.612), "

Management Commitment" (0.633), " Communication and shared decision-making" (0.675) significance correlation coefficient with "information sharing. This test also reveal the factors " Organizational Structure" (0.699), " Risk and Reward Sharing"(0.725), "Management Commitment" (0.697), " Communication and shared decision-making" (0.739) significance correlation coefficient " Mutual Understanding".

The Pearson Correlation coefficient test reveals factors " Risk and Reward Sharing" (0.684), "Management Commitment" (0.652), " Communication and shared decision-making" (0.720) with " Organizational Structure".

The Pearson Correlation coefficient test also reveals factors "Management Commitment" (0.632), " Communication and shared decision-making" (0.656) with " Risk and Reward Sharing"(0.725).

This test also reveals the factors "Management Commitment"(0.696) with "Communication and shared decision-making".

In brief "Information sharing" and "Mutual Understanding" (0.777), " Communication and shared decision-making" and " Mutual Understanding" (0.739), "Communication and shared decision-making" and "Organizational Structure" (0.720) had the strongest Correlation coefficient as compare to the other factors.

**Table 5.** Pearson Correlation coefficient reporting

Factors	Significance Correlation Coefficient	Level of Strong Relation
1." Earning Per Share" with " Operational Profit", "export ", "return on assets"," Economic Value Added". 2."Export" with " Economic Value Added".	1 to 0.8	Very high
1." Information Sharing" with " Mutual Understanding"," Organizational Structure"," Risk and Reward Sharing", "Management Commitment", " Communication and shared decision-making". 2. " Mutual Understanding" with " Organizational Structure", " Risk and Reward Sharing", "Management Commitment"," Communication and shared decision-making"," Information Sharing". 3. " Organizational Structure" with " Information Sharing"," Mutual Understanding", " Risk and Reward Sharing", "Management Commitment"," Communication and shared decision-making". 4. " Risk and Reward Sharing" with " Information Sharing", " Mutual Understanding", " Organizational Structure", "Management Commitment"," Communication and shared decision-making". 5. "Management Commitment" with " Information Sharing"," Mutual Understanding", " Organizational Structure", " Risk and Reward Sharing", " Communication and shared decision-making". 6. " Communication and shared decision-making" with " Information Sharing", " Mutual Understanding", " Organizational Structure"," Risk and Reward Sharing", "Management Commitment". 7. " Operational Profit", with "Export", " Economic Value Added". 8. "Export" with "return on assets". 9." "return on assets" with "Export", " Economic Value Added".	0.6 to 0.8	High
-----	0.4 to 0.6	Middle
-----	0.2 to 0.4	Low
1. " Information Sharing" with "Earning Per Share". 2. " Mutual Understanding" with "Earning Per Share". 3. " Organizational Structure" with "Return on equity", "return on assets"," Operational Profit". 4. " Risk and Reward Sharing" with "return on assets", "earning per share". 6. " Communication and shared decision-making" with " Operational Profit", "return on assets", "earning per share".	0 to 0.2	Extremely Low

**Data Analysis and Result**

**Exploratory Factor Analysis**

In order to inspect accurately convergent and discriminate validity of measurement research items exploratory factor analysis (EFA) using SPSS were conduct. Exploratory factor analysis (EFA) data is simply explored and provides information about the numbers of factors required to represent the data. In exploratory factor analysis, all measured variables are related to every latent variable. The researcher presumes that each variable is related to every latent variable. According to intrinsic value of this research's variables and latent variable appropriate multivariate procedure to measuring variable represent is exploratory factor analysis (EFA) and for choosing appropriate sampling adequacy Kaiser-Meyer-Olkin (KMO) Test Factor Analysis.

In this research to compares the observed correlation matrix to the identity matrix, use Bartlett’s test. it checks if there is a certain redundancy between the variables that it can summarize with a few number of factors. If the variables are perfectly correlated, only one factor is sufficient. If they are orthogonal, we need as many factors as variables.

**Table 6.** KOM Factor Analysis

Factor Analysis	KOMtest	ANOVA	Factor Loading	
			Maximum	Minimum
Information Sharing	0.843	62.058	0.87	0.70
Mutual Perception	0.858	52.84	0.75	0.65
Organizational Structure	0.772	63.87	0.84	0.75
Sharing risks and benefits	0.770	60.06	0.81	0.72
Top-management support and commitment	0.796	61.83	0.84	0.70
Mutual relation and common decision	0.841	51.08	0.83	0.25

**Table 7.** KMO Test Reporting

Research variables	KMO	Level of Factor loadings
-----	Above or Equal to 0.90	Extremely High
Information sharing (0.843), Mutual relation & common decision (0.841), Mutual perception (0.858)		Very High
Organization structure (0.772), Top-management support and commitment (0.796), sharing risks and benefits (0.770)	0.70 – 0.79	High
-----	0.60 – 0.69	Medium
-----	0.50 -0.59	Low
-----	Less than 0.50	Extremely

KMO returns values between 0 and 1. A rule of thumb for interpreting the statistic:

- KMO values between 0.8 and 1 indicate the sampling is adequate
- KMO values less than 0.6 indicate the sampling is not adequate and that remedial action should be taken. Some authors put this value at 0.5, so use your own judgment for values between 0.5 and 0.6.
- KMO Values close to zero means that there are large partial correlations compared to the sum of correlations. In other words, there are widespread correlations which are a large problem for factor analysis.

According to the result test "information sharing" variable maximum factor loading related to question four and minimum factor loading related to question five.

In "Mutual perception" variable maximum factor loading related to question four and minimum factor loading related to question five.

In "Organization structure" variable maximum factor loading related to question four and the minimum factor loading related to question one.

In "sharing risks and benefits" variable maximum factor loading related to question one and minimum factor loading related to question four.

In "Top-management support and commitment" variable maximum factor loading related to question five and minimum factor loading related to question three.

In "Mutual relation & common decision" variable maximum factor loading related to question five and minimum factor loading related to question two.

**Research variables and Measurements**

In this research in order to examine the relationship between one continuous dependent variable from two or more independent variables use multiple linear regression. Multiple linear regressions is the most common form of linear regression analysis. The independent variables can be continuous or categorical, that the result demonstrates in table below.

Table 12. Regression Result Test

Independent variable	Dependent variable											
	EX		OP		ROA		ROE		EPS		EVA	
	Standardized coefficients Beta	t- statistic	Standardized coefficients Beta	t- statistic	Standardized coefficients Beta	t- statistic	Standardized coefficients Beta	t- statistic	Standardized coefficients Beta	t- statistic	Standardized coefficients Beta	t- statistic
constant	117.63	4.981	62.14	4.672	49.962	2.956	78.50	6.479	115.286	0.327	117.256	4.996
IS	-0.277	-2.303	-0.365	-2.998	-0.347	-3.372	-0.407	-3.372	0.165	1.348	-0.275	-2.288
MU	-0.198	-1.411	-0.007	-0.052	-0.014	-0.039	-0.039	-0.275	0.172	1.200	-0.199	-1.415
OS	0.289	2.462	0.250	2.108	0.249	2.094	0.268	2.275	-0.313	-2.617	0.289	2.464
RRS	0.015	0.131	-0.006	-0.050	0.008	0.008	-0.021	-0.189	-0.063	-0.550	0.016	0.141
MC	0.143	1.303	0.250	2.261	0.239	0.239	0.237	2.159	-0.055	-0.497	0.142	1.294
CSD	-0.167	-0.167	-0.110	-1,078	-0.108	-0.108	-0.109	-1.082	0.195	1.897	-0.167	-1.662

In order to undertake hypothesis testing, it needs to express the research hypothesis as a null and alternative hypothesis. The null hypothesis and alternative hypothesis are statements regarding the differences or effects that occur in the population. The level of statistical significance is often expressed as the so-called p-value. The p-value observes the sample results (or more extreme) given that the null hypothesis is true.

Meanwhile, even though SC integration had a significant effect on performance, the level of significant of the path was (p <0.05).

The level of error in this research presents by  $\alpha$ , that in this research assume  $\alpha$  equal to 0.05. So for rejecting null hypothesis refer to below equations.

$$P(\text{Sig.}) < \alpha$$

Table 13. Levelof Significance Research Variables

Independent variable	Dependent variable					
	EX	OP	ROA	ROE	EPS	EVA
	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
IS	0.022	0.005	-0.00.1	0.003	0.179	0.023
MU	0.160	0.925	0.783	0.958	0.232	0.159
OS	0.015	0.038	0.024	0.036	0.010	0.015
RRS	0.896	0.946	0.851	0.960	0.583	0.888
MC	0.194	0.033	0.032	0.025	0.620	0.197
CSD	0.099	0.294	0.281	0.282	0.059	0.098

1. ROE = 57/7 + 9/16 OS+ 7/11MC
2. OP = 12/612 + 9/75 OS+ 9/97 MC
3. EX = 665/115 + 69/717 OS
4. ROA= 62/ 159OS + 62 /117MC
5. EVA= 665/16 + 69/516OS

The Regression equation first demonstrates "organizational structure" and "Top-management support and commitment" direct positive effect on "return on shareholder's equity".

The regression equation second demonstrates "organizational structure" and" Top-management support and commitment" direct positive effect on "operational profit".

The regression equation third demonstrates "organizational structure" just direct positive effect on "Export".

The regression equation fourth demonstrates "organizational structure" direct positive effect on "return back on investment or assets".

The regression equation fifth demonstrates "organizational structure" direct positive effect on "EVA" (economic value added).

The Friedman test is the non-parametric alternative to the one-way ANOVA with repeated measures. It is used to test for differences between groups when the dependent variable being measured is ordinal. It can also be used for continuous data that has violated the assumptions necessary to run the one-way ANOVA with repeated measures.

**Table 14.** Chi-Square test

Number item	Chi-square	Degrees of freedom	Asymp. Sig.
181	184.37	5	0.000

The chi-square test uses when trying to find a relationship between two nominal or ordinal variables. To reiterate, a nominal variable is one that is only measured by naming categories. An ordinal variable is similar to a nominal variable, but the categories can be put in an order (ranked highest to lowest).

The Friedman test is a non-parametric statistical test similar to the parametric repeated measures ANOVA. It is used to detect differences between groups when the dependent variable being measured is ordinal. The procedure involves ranking each row (or block) together, then considering the values of ranks by columns. Actually whereas Friedman test specify each variables ranking, it reveals in case the factor loading's text be significant.

According to table 14, Sig <0 it is significant difference within ranking average, so it proved the variables' research qualified for ranking. The table 15 respectively represents variables ranking.

**Table 15.** Respectively represents variables ranking.

Friedman Test	Measurement items	Ranking Average
1	Mutual perception	4.60
2	Top-management support and commitment	4.33
3	Information sharing	3.59
4	sharing risks and benefits	3.01
5	Mutual relation & common decision	2.97
6	Organization structure	2.50

**Conclusion and Implications**

**Pearson Correlation Coefficient Matrix Result**

In this research contemplate to correlation between the researches' variable using Pearson correlation coefficient test. This ultimate intent of this study the Pearson correlation coefficient test result reveals the maximum correlation was within

"Information sharing" and "Mutual perception",

"Mutual relation & common decision " and "Mutual perception",

" Mutual relation & common decision " and " Organization structure"

Eventually all independent variables' this research have strongly correlation together that those of them mentioned above, they are the most important. Besides independent and dependent variables' this research the strongest correlation are between " Stock Return" and " Top-management support and commitment", "Mutual perception" and " earning per share", "Information sharing" and " earning per share".

**Regression Test**

According to research sample size, a path analysis model for directly observed variables was used to test the research hypotheses. This multivariate regression technique considers the model as system of equations and estimates all the structural coefficients directly. Thus, each variable comprised in this study equal to the mean of the construct's items. Due to regression result test two factors "Organization structure" and" Top-management support and commitment" have directly positive influenced on "return on capital", "return on investment" and "operating profit". So those firms that their organization structure and good commitment to supply chain vision, their "return on investment" and "operation profit" are better than the other firms.

Likewise, the good organization structure firms have better influenced on EVA (economic value added) and more export value.

Due to Rosenzweig and his colleague 2003 researched supply chain integration influence direct positive effect on "return on capital" and "earnings from launched new product" but supply chain integration doesn't any effect on "selling growth". Thus in this study "organizational structure" and "Top-management support and commitment" direct positive influenced on "return on capital".

#### **Friedman Test**

This research Friedman test reveals in Iranian pharmaceutical industries most important factor in supply chain integration, it is " Mutual perception" and after that due to priority they are " Top-management support and commitment", "Information sharing", "sharing risks and benefits", " Mutual relation & common decision " and "organizational structure". According to Rajesh K. Singh researches in this subject revealed that " Top-management support and commitment" most important factor so this research's result almost conforms to Rajesh K. Singh researches.

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