

The Investigation of the Impacts of Advanced Consistency Mechanisms on Organizational Process Integration

Javad Aliakbari^a, Amir Hassanzadeh^b, Abolfazl Aliakbari^c, Mehrnoush Taherkhani^d

^aPhD. Student in Organizational Behaviour Management, University of Tehran(UT)

^bPhD. student in Industrial Management, University of Tehran(UT)

^cMA in Industrial engineering, Islamic Azad University of Qazvin

^dPhD. Student, Department Of Mechanic and industrial Engineering , Islamic Azad University of Takestan

ABSTRACT

Introduction: Nowadays the application of communication and information technology in the consistency of organizations has drawn the attention of several researchers and careers. Recent developments in IT have modified information exchange among the members of the provision chain. Information transmission via Internet in the process of the common transaction of consigned cargoes, the management of the property by the retailer and planning, and the common prediction and replenishing plays an essential role in the management of the electronic chains.

Purpose of the Study: This article examines the application of these consistency mechanisms that influence all informational, financial, and physical processes and their role in the consistency of organizational processes.

Methodology: To this end, the way the mechanisms influence the consistency of organizational processes has been studied by specifying the important factors in these two areas via Factor Analysis and Correlation.

Results of the Study: The results indicate that the more advanced the consistency instruments we use, the more important the confidence factor is. Thus without advanced consistency mechanisms it is not possible to homogenize the organizational processes.

Limitations of the Study: Despite all of the advantages present in each of the mechanisms, briefing the experts of the provision chain on using each of the mechanisms requires time.

Administrative functions of the Study:

Logistic managers and the provision chains in industrial, business, and service companies can examine each of the consistency mechanisms with regard to the conditions and factors required for the execution of each of them.

Novelty of the Study: The original aspect of this study is its simultaneous examination of the consistency mechanisms in the homogeneity of organizational processes in auto industry.

KEYWORDS: Supply chain management, Organizational process integration, Consignment, Vendor managed inventory, Collaborative Planning, Forecasting, and Replenishment.

1. INTRODUCTION

Supply chain consists of physical flows of material and information from resource to customer. The main activities of supply chain manager include production planning, buying, material management, distribution, customer service and sales forecasting. In recent years decision making of the management has inclined towards facilities and their major concern has been profitability. Therefore different functions of a company such as assembly, storekeeping and distribution are mostly handled distinctively and since the members were autonomous in such condition, so the decision making process would be very easy regarding the fact that neglecting the dependencies sometimes lead to insufficiency and increment in costs(Griffin, 1996: 1-15). Nowadays the emerging change in processes and businesses of organizations made companies change their distinct decision making style to integrated one, in order to be able to survive and maintain their competitive situation(Tipton & Krause, 2003). The essence of information management in supply chains has changed by the emergence of web-based information transference between different parties of supply chain (Johnson & Whang, 2002: 24-38). In the process of collaborative businesses such as Vendor Managed Inventory (VMI) and Collaborative Planning, Forecasting, and Replenishment (CPFR) sharing effective information is considered a success criterion for the companies (McLaren T.etal, 2004: 207-222). Therefore it is crystal clear that IT, application of electronic business and new business models play essential role in managing supply chains (WU F. et al, 2003: 425-447). In particular, progress made in data integration makes the supply chain capable of gaining return of investment by reducing order cycle, more agility to respond to customers and more profitability. In this regard, organizations can utilize software packages to perform activities such as Enterprise Resource Planning (ERP), inventory management, transport and logistics management, advanced timing and planning, tracking by satellite, computer based ordering, Electronic data

*Corresponding Author: Javad Aliakbari, PhD. Student in Organizational Behaviour Management, University of Tehran(UT).
Javester2007@gmail.com

interchange (EDI), intranet and extranet, tracking Points of Sale (POS). A series of consistency tools like consignment that is a agreeable policy, Quick Response (QR), Efficient Consumer Response (ECR) which leads to VMI (Cetynkaya s. 2000: 217-232) and an advanced type of consistency that is CPFR throughout the supply chain and among all the parties (Boone et al, 2000: 1-14), to quicken the decision making process, and all of them are based on EDI and Internet technology. In recent years, these mechanisms led to performance improvement in supply chain because of efficiency in collaborative decision making and sharing information (Disney et al, 2007: 625-651). Now we study the implementation of these consistency mechanisms that influence all informational, financial and physical processes and then we survey its role on the organizational process integration.

This paper seeks the response for the following questions; 1. Which mechanisms lead to better performance of the system? 2. Merely using the advanced mechanisms lead to better integration of organizational processes or not?

Next section is about research literature that includes a brief explanation of supply chain literature, consistency mechanisms and organizational process integration. Section three is about methodology of this paper. Section four goes through statistical analysis in two parts; part one surveys factor analysis and part two surveys correlation analysis. Section five discusses the results that are obtained by statistical analysis and presents conclusions and suggestions.

2. LITERATURE

2.1 CONSIGNMENT

The history of this tool goes back to probably 400 years ago and it has been in use for daily business since then (Fenton et al, 1987: 1). New form of consignment was used in retailing business product in the economic stagnancy period of 1930. Due to economic reasons, today production and retailing is even more popular. Generally consignment is an agreement or a contract between the producer and the buyer. In such agreement, suppliers keep their inventories until the buyer surrender to use them (Harding & Mary LU, 1999: 37). As far as the inventory is processed by the producer and they are not consumed, buyer pays no money (Gerber & Ned, 1991: 30-32). In such policy supplier settles the accounts with the buyer about defective products in specific periods. In these periods no capital is collected from delayed receiving accounts. By such agreement they formulize the inventory management problem as a deterministic one (Aggarwal et al, 1995: 658-662). This agreement specifies exact level of inventory, point of transferring ownership, inventory accounts and responsibilities for possible loss (Harding & Mary LU, 1999: 37). Consignment is a solution for the Controversial conflicts, irrelevancy of information and traditional supply chain (Corbett, 2001: 487). In other words, consignment plan may diminish the bad effects of deficiency made by information irrelevancy and change in the motivation structure. Analyzing the model shows that; if the initial cost of starting is just defined and clear for the supplier, then consignment can reduce the bad effects of the information irrelevancy (Corbett & Charles J., 2001: 487). Valentini & Zavanella presented a model for managing consignment and studied its effects on supply chain (Valentini & Zavanella, 2003: 215-224). According to this model the buyer is just charged for saving the inventory and the supplier is in charge of the opportunity cost of keeping the inventory while not using consignment. Analyzing the model shows that consignment policy reduces the total cost by 6 percent in relation to the traditional methods. This policy is important for retailer and supplier, because it leads to lowest level of buyer inventory and then lowest level of giving service regarding to cost (Valentini et al, 2005: 215-224).

2.2 VENDOR-MANAGED INVENTORY

This policy springs from the cooperation between supplier and retailer and it aims to improve the performance of the whole supply chain (Simchi-Levi et al, 2000). Supply chain always encounters a major limitation that is exchange of contradictory profit and goals between retailer and supplier that stems from the essence of the business. Reduction of inventory level in supplier side means that we brought down some costs, but it can also reduce the level of sales and giving service. VMI is presented as an advanced communication method between retailer and supplier for the reason that it goes further than just sharing information and covers consignment plan. In such system, a supplier is totally responsible for managing inventory in the retailer's place. Due to the prior agreement between supplier and retailer supplier manages the retailer's inventory by setting exact amount of order and inventory that it can deduct from the POS of the retailer (Waller et al, 1999: 183-203). Major goals of VMI are as follows: reduction of inventory level, improvement in simultaneously giving service (Levy et al, 2000: 415-429). VMI is previously utilized different industries such as retailers like Wal-Mart and Kmart (aviv et al, 1998), (Gnanasekaran & Nikesh, 2000) and (Mackenzie & David, 1999), distant communication industries, Hygienic industries like integrated multi hospitals (Haavik & Stan, 2000: 56-61). Aviv and Federgruen has formulized the VMI model according to a two level concentrated inventory planning that consist of a supplier and a few retailers (Aviv and Federgruen, 1998). In this pattern they evaluate the information sharing while the supplier has a direct access to demand information of the retailers. Numerical examples of applying VMI shows an average cost reduction of 4.7 percent (Aviv et al, 1998). Waller has surveyed the value of VMI in a two level structure that consists of a supplier and a few retailers. Results show that VMI reduces the inventory level by 85 to 95 percent for retailer side while such reduction is about 80 percent for the supplier, because of the required safety saving. In this regard distribution of demand plays an important role in the VMI effect on inventory since the reduction of inventory is far more while the variance of demand is low (waller et al, 1999: 183-203). Disney and Towill have studied the

effects of VMI on different resources of bullwhip effect. They showed that VMI can be means for eliminating different levels of supply chain, so it can diminish the bullwhip effect by omitting delay of information, raw material and the upward flows of the supply chain (Disney and Towill, 2007: 625-651).

2.3 COLLABORATIVE PLANNING, FORECASTING AND REPLENISHMENT

CPFR is defined as a formal process between two business partners to collaboratively utilize Planning and forecasting, supervise by Replenishment and identify and respond to any exceptions (Vics, 2002). CPFR is the modern consistency model for supply chain that conforms to the principles of Efficient Customer Response (ECR). The main concept of CPFR a modern business model that has a overall view of supply chain. In this model a chain is a network of business partners that are to synchronize activities to deliver product to customer by interchanging information in a consistent relation (Sternan & J.D, 1989: 321-339). In other words CPFR is a consistent system in a supply chain that all parties collaboratively initiate activities such as planning and processes like sales, order forecasting, production plan, delivery and order generating (Boone et al, 2000: 1-14). Their studies mostly concentrate on forecasting aspects of CPFR and survey the effect of it on business processes and system performance. They claimed that forecasting can utilize forecasting means in a better way by using different business processes. Their definition of CPFR is very close to concentrated decision making systems, in which all parties share POS information, forecasting, production plans and product delivery. McCarthy and Golitic showed that consistency and forecasting are two business activities that anonymously improve supply chain performance. They claim that the combination of these two factors can systematically concord business companies and therefore create opportunities to improve supply chain performance (McCarthy et al, 2002: 431-454). Aviv has surveyed consistent information sharing, VMI and consistent forecasting by analyzing three supply chain models and tested their effects on supply chain performance. Numerical examples show that CPFR improves supply chain performance and advantages of consistency means like VMI, consistent forecasting and Replenishment would be even more if demand process has more correlation in the period and supplier and retailer can interchange more information about it (Aviv & Yossi, 2002: 55-74).

2.4 ORGANIZATIONAL PROCESS INTEGRATION

In the 1990s innovations in IT led to development of vast spectrum of software packages that aimed to integrate flow of information throughout the company. In that period an organizational system drew the attention of the companies that was Enterprise Resource Planning (ERP). The goal of this system is to integrate business processes by providing an integrated information system (O'Brien & J, 1999). ERP accepts to manage business from organizational point of view and aims to integrate functional systems such as production and operational systems, financial systems and supplies and distribution systems. These systems allow companies to change their current information systems and they also help to standardize management information system (Prasad et al, 1999: 7-14) and (Yusuf Y., 1998: 66-86). ERP uses internet to integrate information flow of internal function of a business such as customer information and suppliers. This system supports all areas of an organization, intersections of departments, functions of departments and factories in a virtual context. Developing an ERP system in huge producing organizations requires integration of operational activities and information systems (Davenport T., 1998: 1011-1022). Companies which use ERP can gain a competitive profit by executing the system and then extract the results. Companies that installed ERP claim that in the market they are more agile than their competitors who hardly ever change their systems (Latamore G., 1999: 505-515). Integration of information in customer ordering of ERP helps maintain information such as customer ordering from taking the order and receiving raw material from supplier to delivery of product and settling the accounts with the customers in an integrated way and through these companies are enabled to track the orders and concord different departments of the company (Wu f. et al, 2003: 425-447).

3. RESEARCH METHODOLOGY

Due to research literature, it is clear that each mechanism anonymously effect the chain leading to organizational integration, but the one which can be performed better in the organization is yet to be decided. In this paper we perform an experimental study and we use descriptive research with inductive reasoning. This paper has practical results and contains qualitative variables and also it is classified as correlation research. Correlation researches are the ones that specify the relationship between variables by applying correlation coefficient. Statistical analysis is performed by SPSS 19 software. In order to extract the due information, we performed an experimental study and took information from experts and sophisticated clerks and in addition to literature studies. In this regard we prepared a questionnaire containing factors of consistency mechanisms and organizational process integration. For responding to the questions of this questionnaire we used 5-choice lykert spectrum. To gain the appropriate validity in the questionnaire and lessen the risks of deviation of the results, we used a pilot by a pretest by 15 experts of supply chain. Measurement test is fulfilled under the real executive conditions (Sheasley P.B, 1983). As the size of the society is approximately indefinite and unidentifiable, the sample volume would be 150 experts in confidence level of 95 percent and accuracy level of 10 percent (Momeny M., 2007). After initial studies , in second step we distributed 150 questionnaires between production and planning managers, expert and experienced clerks and active supervisors

in an automobile industry and its suppliers of level one and two in the supply chain (supplies, sales and after sales departments). Hence, 31 factors accumulated for consistency mechanisms as the result. The results covered three dimensions for consignment, two dimensions for organizational process integration and four dimensions for each of the other factors (these factors are presented in the appendix). We also justified the questionnaire by consulting some university professors and experts in order to confirm the reliability of it. We checked the reliability of the questionnaire by Cochran's Alpha that came out to be 0.759 (Momeny M., 2007); which turned to 0.786 after elimination of some factors (Nunnally j., 1988).

4. STATISTICAL ANALYSIS

4.1 Factor Analysis

Factor analysis is a statistical method which is widely used in psychological and social science studies. Factor analysis is a combination of statistical methods that are to simplify a set of complicated data. In social science we use factor analysis to indicate correlation between variables (Kline p., 1994). From summarizing point of view factor analysis clarifies the variables that act better and indicates the number factors that are more effective in factor analysis. Factor analysis presents a new set of variable that enjoy the same essence and attitude and they are representative of a greater set of variables. In this method problems regarding numerous variables or dependencies between them can effectively diminish by replacing new set of variable. Researcher can use experimental anticipation or direct insight to get to understand the conceptual basis and conclusion analysis (Fathian et al, 2008: 578-590). In this paper we used factor analysis to reduce the factors of organizational process integration and identify the more important ones. To maintain the structure and framework of the presented model we used confirmatory factor analysis (Kline p., 1994).

Before putting factor analysis into practice we should perform a KMO test in order to become sure of the quality of sampling (Momeny M., 2007). Generally KMO should be more than 0.5, but in this paper it is considered 0.6 for more confidence (Hanafizadeh et al, 2009: 1-29). Indicators of KMO are shown in table 1, so in this paper the number of questionnaire seems sufficient and Bartlet value test is less than 5 percent that shows factor analysis is appropriate for identifying structure of factor model (Momeny M., 2007) and the hypothesis that correlation matrix is known (unity and similarity of correlation matrix) is rejected. By applying Varimax rotation we surveyed the role of each factor among all. In this section if the abstract of factor weight of these factors is more than 0.5 at least in one element (Baggozi RP & Yi Y., 1988: 74-94), the related factor will have the greatest effect on the change of variables. Factor analysis was fulfilled on the variable by consistency mechanisms and the results presented in tables 2, 3 and 4. Consignment mechanisms divided into three dimensions (table 2) and as the abstract numbers are more than 0.5, so all factors are accepted.

Table I. Validity analysis for surveying quality of the sampling

	KMO	NO. of Factors	Considerations
consignment	0.837	7
VMI	0.646	13	Factors 4, 5, 7 and 8 eliminated and KMO=0.702
CPFR	0.763	11	Factors 1 and 2 eliminated and KMO=0.853
Internal dimension	0.792	4	Factors 4 eliminated and KMO=0.820
External dimension	0.803	4	Factors 4 eliminated and KMO=0.832

Table II. Factor analysis of the consignment mechanism factors

Dimensions	Factors	Factor Weight	Decision
Trust	Supplier trusts retailer	0.853	accepted
	retailer trusts Supplier	0.605	accepted
Cost Payment	Supplier has no cost or deficiency (warehouse belongs to retailer)	0.573	accepted
	Retailer is in charge of keeping and deficiency costs	0.853	accepted
	Accounts are settled after the retailer sells the product	0.741	accepted
Decision Making Authority	Each member is responsible for its own ordering	0.798	accepted
	Ownership of the inventory is for retailer in its warehouse	0.850	accepted

Table III. Factor analysis of the VMI mechanism factors

Dimensions	Factors	Factor Weight	Decision
Sharing information	Timing of replenishment by supplier	0.857	accepted
	Historical review of the ordering by supplier	0.689	accepted
	Sending invoice by supplier via EDI	0.904	accepted
	Clearness of inventory level of retailer for supplier	0.486	rejected
	Clearness of inventory policy of the customer for the supplier	0.459	rejected
	Demand forecasting upon POS by supplier	0.752	accepted
	Giving forecasting parameters to supplier	0.482	accepted
Trust	Retailer trusts supplier	0.387	rejected
Cost Payment	retailer has no cost or deficiency	0.521	accepted
	supplier is in charge of keeping and deficiency costs	0.649	accepted
	Amount of payment is sent to buyer via EDI	0.639	accepted
Decision Making Authority	Supplier is responsible for ordering and delivery timing	0.781	accepted
	Ownership of the inventory is for supplier	0.723	accepted

Table IV. Factor analysis of the CPFR mechanism factors

Dimensions	Factors	Factor Weight	Decision
Sharing information	Collaborative timing of replenishment by all members of chain	0.359	rejected
	Collaborative timing of order delivery	0.428	rejected
	Clearness of inventory level of members for all others	0.679	accepted
	Clearness of utilized policy for all members	0.792	accepted
	Collaborative demand forecasting	0.827	accepted
	Giving real information by all members	0.687	accepted
Trust	full trusts among all members	0.806	accepted
Cost Payment	Each member has keeping and deficiency cost of its own	0.897	accepted
	Amount of payment is sent to all members via EDI	0.822	accepted
Decision Making Authority	All members are responsible for ordering and production-sales planning	0.762	accepted
	Each member has ownership of its own in its section	0.678	accepted

Table V. Analysis of Integration Correlation

Internal Dimension				Organizational Process Integration	Consistency mechanisms
Human Resource	financial	Sales and Marketing	Production, operation and support		
0.003	0.04	0.128*	0.132*	Trust	Consignment
0.024	0.253*	0.185*	0.002	Cost payment	
0.01	0.048	0.056*	0.546*	Decision Making Authority	
0.05	0.425*	0.348*	0.248*	Sharing information	VMI
0.012	0.563*	0.352*	0.04	Cost payment	
0.23*	0.014	0.029	0.218*	Decision Making Authority	
0.011	0.001	0.125*	0.237*	Sharing information	CPFR
0.031	0.287*	0.489*	0.25*	Trust	
0.012	0.514*	0.012	0.21*	Cost payment	
0.51*	0.130*	0.21*	0.63*	Decision Making Authority	

External Dimension				Organizational Process Integration	Consistency mechanisms
Human Resource	financial	Sales and Marketing	Production, operation and support		
0.021	0.04	0.005	0.049		Trust
0.022	0.12*	0.157*	0.007		Cost payment
0.030	0.27*	0.013	0.256		Decision Making Authority
0.047	0.43*	0.381*	0.301*		Sharing information
0.014	0.52*	0.412*	0.002		Cost payment
0.10*	0.002	0.016	0.157*		Decision Making Authority
0.026	0.047	0.028	0.002		Sharing information
0.001	0.026	0.028	0.02		Trust
0.034	0.031	0.045	0.012		Cost payment
0.046	0.003	0.012	0.042		Decision Making Authority

Significance level for $\alpha \geq 0.05$

4.2 CORRELATION ANALYSIS

In this paper, we used Spearman correlation coefficient for correlation analysis. Hence the correlation test analyzes the correlation between the variables of two cases; consistency mechanisms and organizational process integration that the results are presented in table 5. In table 5 correlation analysis is done two by two, in order to specify the factors of consistency mechanisms which are related to the ones in organizational process integration. The correlation coefficient is anticipated in order to identify the factors which have relation with all other factors at significance level.

5. DISCUSSION AND CONCLUSION

As shown in table 5, consignment consistency mechanism points to internal consistency that was predictable beforehand. In other words this mechanism plays a positive role in most of internal integration dimensions, but in external dimensions this relation is placed on paying cost, so we can overall conclude that we can use this mechanism for electronic payment of costs rather than others. In VMI which is based on demand initial information transmission to first hand suppliers, in both dimensions integration has been accepted. Since, order delivery is authored by the supplier in specific time, so the supplier is to send payment sheet by EDI and though we would have economy on the payment. In advanced CPFR mechanisms since all traditional activities are going to be fulfilled by consistency, so there should be a full trust throughout the chain. This mechanism has high correlation in information, cost payment and decision making authority; and as full trust is a necessity, so in external dimensions the correlation gravely comes down. As a conclusion we can generally say that; the more we use advanced consistency means, the more important becomes the trust factor. For instance, although CPFR mechanism has scientifically higher efficiency rather than the others, it is less important in case studies that is maybe because of the lack of trust among chain members. On the other hand VMI mechanism indicates that information integration mechanism is of high importance according to table 5 and this matter is because of the fact that automobile industry has to deliver product to customers as soon as possible in case of higher keeping costs caused by huge volume of inventory which requires sharing the real information about demand throughout the supply chain.

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