Impact of supply chain integration on the performance of Bahman group

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Abstract
Supply chain integration is widely considered by both practitioners and researchers a vital contributor to supply chain performance. The two key flows in such relationships are material and information. Previous studies have addressed information integration and material (logistics) integration in separate studies. In this paper, we investigate the integrations of both information and material flows between supply chain partners and their effect on operational performance. Specifically, we examine the role of long-term supplier relationship as the driver of the integration. We used questionnaire for gathering data. The reliability of each factor was more than 0.70 by Cronbach's alpha. Using data from Bahman group managers and staffs of logistics, IT, purchase and customer services, we find that information integration (information technology and information sharing) positively influence logistic integration and via this factor it improves performance. We also demonstrate that long term relationship with suppliers indirectly improves performance through information and logistic integration.

Key words: Supply chain integration, Logistic integration, Information integration, Performance.
1. Introduction

During the 1950s and 1960s, most manufacturers emphasized mass production as a strategy to reduce their production costs. In this environment, product development was very slow and limited to the ability of domestic producers. Bottlenecks in production lines, leading to a host of operations during the construction works were documented. On the other hand, common technology and communicating with customers and suppliers was considered unacceptable risk and little emphasis on the strategic partnership between the buyer and the supplier. In the 1970s, introducing the concept of manufacturing resource planning, materials management, and new concepts relying on manufacturers to improve their performance within their companies. Intensifying global competition in the global balance of 1980 to provide organizations with products with lower prices, higher quality and reliability that have a more flexible design. Coordination in the supply chain circles was studied and various articles on this topic have been conducted since 1990 in most scientific.

Most concepts of supply chain integration explicitly recognize the existence of two flows through the chain; there is a flow of goods and an equally important flow of information. Supply chain integration must comprise both information and material, and cannot restrict itself to only one. Higher levels of integration are characterized by increased logistics-related communication, greater coordination of the firm’s logistics activities with those of its suppliers and customers, and more blurred organizational distinctions between the logistics activities of the firm and those of its suppliers and customers. Coordination, collaboration, and cooperation are often used more of less interchangeably for describing integrative efforts among partners to improve the overall efficiency of the supply chain (Prajogo & Olhager, 2012).

Coordination in the supply chain has many different forms, but, as whole, the purpose of all kinds of coordination is that entities in a chain of end customer information or the final consumer of goods and services, particularly be aware of the amount of actual demand to have the knowledge to produce programs, schedule, control the level of Inventory, design their products in the way that be able to deliver them at the right time, right place to consumer in order to attract customer satisfaction and be successful in competitive market ahead of their competitors. (Li & woo, 2004). The integrated supply chain structure is relatively new research area, although many studies have been made in this relationship and also partnership between manufacturer and customer or supplier. While some studies have focused on the review of relations with partners in the supply chain, others focus on managing a supply chain as a single system. “The term integration” refer to control a number of similar economic or industrial processes that were previously been controlled separately. To use the term supply chain integration can be defined as such:

“To the extent that a manufacturer has strategic partnerships with supply chain partners and processes within and outside the organization runs, aim to achieve effective and efficient flow of products, services, information, money that lead to decisions which provide maximum value to the customer with low cost and high speed.” (B. Flynn et al, 2010).

Several researchers have studied the supply chain integration, with the difference that each of them studied the topic according to the specific dimension of issue. Steven (1989) classified supply chain integration into three levels: functional integration, internal integration, external integration. Internal integration shows customer needs support at the lowest level of expenditures, internal integration, the integration of all internal operations, materials management, production, sale and distribution. Internal integration is described by the distribution and sale, and requires the integration of all functions controlled by the company in order to reach customer satisfaction. In other words, it has a particular attention to the connection of functional areas such as procurement and purchasing, production, logistics, marketing, sales and distribution. (Saee&Nakhaee,2006) External integration expands the integration domain to outside of the organization to include suppliers and customers. According to the literature on external integration, there are two major areas that have been thoroughly emphasized: customer integration, supplier integration. Frohlich and Westbrook (2001), studied supply chain integration, according to the dimensions of supplier and customer and investigated its effect on market performance. They found that wider scope of integration is positively associated with improved performance. Narasimhan and Kim (2002) reviewed integration from the point of internal integration, supplier and customer. Sheu et al (2006) based on a study of the integration of suppliers in Taiwan defined a model that includes long-term relations, information architecture, performance, suppliers and retailers participation. In this paper the relationship between information integration, logistics integration, long-term relationships and their impact on performance are examined. It should be noted that this review of the structure proposed by Chen and Poulraj (2004). Information integration in our study considered as information technology and information
sharing. In this paper, first examine the relationships and assumptions. Then express framework, methodology and results. Finally, limitations and suggestions are provided.

2. Literature review

In this section, first we review the concept of logistics integration and its impact on operational performance. Then we expressed information integration - information technology and information sharing - in supporting integration of material flow (logistics). In the next step we review long-term relationships with suppliers as an introduction to information management and the impact on the performance. At last the research hypotheses are presented. These assumptions connect 4 variables of long-term relationships, information integration, logistic integration and performance together.

2.1 Logistic integration.

Increasing competition not only guides organizations to improve their internal operations (process control and inventory management) but also focuses on the integration of suppliers and customers in the entire processes of chain. Thus, suppliers’ involvement in delivering value to customers causes competitive capabilities such as quality, delivery, flexibility and cost (Prajogo & Olhager, 2012). Logistics was defined as "process of scheduling" run and control the flow, storage of raw materials, inventory in manufacturing, final product and its related information at the minimum cost. According to this definition, the entire process of logistics, combine a large number of activities with suitable integration in order to implement the right to meet customer needs to reach smooth flow of operations through the chain and the most portion of profit for organization and customer. (Valizade & Malaki rad, 2011)

According to Stock et al (2000), Logistics integration refers to specific logistics practices and operational activities that coordinate the flow of materials from suppliers to customers throughout the value stream. In other words, higher levels of integration are characterized by increased logistics-related communication, greater coordination of the firm’s logistics activities with those of its suppliers and customers, and more blurred organizational distinctions between the logistics activities of the firm and those of its suppliers and customers. (Prajogo & Olhager, 2012)

The goal of logistics management is planning and coordinating all activities which are necessary to achieve desired levels of quality and customer service with the lowest possible cost. Logistics is thus a link between marketing and operational activities. Logistics working area within the organization start from supply and management of raw materials to delivery final product to market and customers. (Valizade & Malaki rad, 2011)

Logistics integration decreases various problems such as bullwhip effect and gives the organizations and partners the opportunity to benefit from vertical integration (quality, reliability, planning and control and lower cost). Improved logistics integration between supply chain partners yields a number of operational benefits, including reduction in costs, lead time, and risks as well as improvement in sales, distribution, customer services, and service levels and customer satisfaction. (Stock et al, 1998)

Most studies reported a positive relationship between logistics integration and performance. Some of these studies include:

Romano (2003) suggested logistics processes play a key role for integration between organizations.

Prajogo & Olhager (2012) wrote improving the logistics integration is an important factor for achieving operational benefits such as reduced costs, delays, hazards, improved sales, distribution, customer service, service levels and customer satisfaction.

Fox et al (1993) argued logistics is responsible for coordinating companies, suppliers, and distribution centers in order to achieve all possible outcomes and supply chain goals, including timely delivery, and minimizing costs ... logistics includes the flow of materials and goods from the supplier of raw material to consumer of finished goods.

Frohlich and Westbrook (2001), found much wider range of integration, the relationship is stronger with improved performance.

Sheu et al (2006) concluded that the higher participation levels leads to operational efficiency in the supply chain system.

Li et al (2009) stated supply chain integration is significantly associated with supply chain performance.
2.2 **Information integration.**

In supply chain, the importance of coordinating activities is important. This point is also noticeable for information management in the chain, information management systems and the data transaction. Coordinated and appropriate information between partners will lead to growing impacts on the speed, accuracy, quality and other aspects. Effective information management will lead to greater coordination in the chain. Information integration is the extent that operational, tactical and strategic information are transferred between business partners and the central company. (Elahi et al, 2009) Frohlich and Westbrook (2001) downward flow of material in supply chain should be supported through information flows from bottom to top. Kalakota and Robinson suggested that significant progress in supply chain management can be achieved through the integration of business processes and information flow between business partners. Lai et al (2007) defined information integration as using information and communication technology in order to coordinate decisions and activities between an organization and its partner. Jayaram and Tan (2010) concluded that information integration has positive relationship with performance of an organization. Information integration in this study is reviewed through two dimensions of information technology (technical) and information sharing (social dimension). Importantly, to emphasis on information technology without the willingness to share critical information will not significantly associate organizations together. So they may fail in integrating their logistics. In other words, that organizations notice both side of information integration can then use the maximum benefits of integrated logistics.

2.2.1 **Information technology.**

Using information technology has the potential of developing supply chain partners in order to work together for efficient delivery of products to consumers. Information technology allows the supply chain partners act as a single entity. (Marzang, 2010) information technology is a mixture of telecommunications achievements, methods and strategies for problem solving and leadership skills using computer knowledge and include issues related to advanced science and computer technology, computer design, information systems implementation and their applications. (Dorudchi&Nikmehr, 2007)

NASA (2001) knows information technology as compilation of traditional computer science and information technology for storage, processing and exchange of any data (including text, sound and image, etc.) Information (and communication) technology plays a central role in supply chain management in the following aspects. First, IT allows firms to increase the volume and complexity of information which needs to be communicated with their trading partners. Second, IT allows firms to provide real-time supply chain information, including inventory level, delivery status, and production planning and scheduling which enables firms to manage and control its supply chain activities. Third, IT also facilitates the alignment of forecasting and scheduling of operations between firms and suppliers, allowing better inter-firms coordination. (Prajogo & Olhager, 2012)

Vickrey et al (2003) explained that integrated information technology, is a key factor for supply chain integration. These technologies include electronic data exchange between organizations and within organizations through material requirement planning systems.

Elahi et al (2009) stated that information technology plays a vital role in the success or failure of the supply chain. When suppliers are scattered across the world, integration of activities within and outside the company become important. This requires an integrated information system, which leads to information-sharing.

Devaraj et al (2007) have concluded that information technology affects information integration and production in supply chain and Supplier integration has a positive impact on organizational performance. Kelle and Akbulut (2005) concluded using information technology in supply chain management leads to integration and coordination of material flow, financial flow and information flow between suppliers, manufacturers, wholesalers, retailers and final customers.

Prajogo & Olhager (2012) concluded that IT has a positive impact on logistics integration.

2.2.2 **Information sharing.**

While the technological aspect of information integration is important, it is the frequency, the quantity and the quality of information that is shared that really matters. Information sharing means “supply chain companies’ willingness to give accurate, timely, related and common information to each other in order to create harmony at all levels of the supply chain.”

Information sharing in organizations causes better decisions, capacity allocation, production and materials planning through increased transparency, demand, supply and inventory. Studies show that information sharing acts as a key component in achieving an integrated supply chain. Some results are as follow:
Increase coordination, reduce uncertainty, expedite material flow, accelerate order fulfillment, reduced inventory costs, increase customer satisfaction by reliable and fast delivering, improve performance, increase operational effectiveness, reducing bullwhip effect and ..... (Koçoğlu et al, 2011)

Green and Shaw expressed that an important strategy for managing integrated supply chain is information sharing between trading partners. One of the main benefits of information sharing is inventory reduction. Koçoğlu et al (2011) suggested Information sharing significantly reduce supply chain costs, improve communication with partners, increase the flow of materials, fast delivery, order fulfillment, and ultimately improve customer satisfaction, improve coordination and facilitate access to the competitive position.

2.3 Long term relationship.

The ways firms relate with suppliers have changed considerably. Given that manufacturing firms are getting more and more focused on their core competence, their reliance on strategic supplier increases. Among the changes, three key aspects of supplier relationships are highlighted here. First, the trend now is to build a long-term relationship with suppliers rather than short-term contracts. Second, in conjunction with the first point, firms now use fewer suppliers over a longer period of time rather than keeping a large base of suppliers which allow them to change suppliers for almost every contract. The benefits of having low price resulted from creating competition among suppliers are now changed into low total cost of ownership due to long-term and large volume of purchases. Third, the relationship with suppliers has been enhanced into strategic level where suppliers are now considered as the integral part of the firm’s operations. This change has led to various avenues of collaboration, including joint improvement program, early supplier integration in product design, and profit and risk sharing. One aspect of strategic supplier relationship is extended longevity. (Prajogo & Olhager, 2012)

Create, maintain and improve relations between organizations aim at achieving business goals that organizations can’t achieve lonely. In supply chain configuration, inter organizational relationships is usually obtained through partnerships or buyer – seller relations. Supplier participation in the supply chain shows agreement between manufacturing organizations and their participants. This includes sharing essential information. (Cheng, 2011)

Handfield and Nichols (1999) stressed the importance of relationships in effective management of supply chains and concluded without an effective base for organizational relationships in supply chain any attempt to manage the flow of information and materials throughout the supply chain is faced with failure.

Das et al (2006) when a buyer determines a time for supplier integration in relation to advancement plans, it means this decision will cause improvements in delivery times.

Spekman et al (1998) believed trust and commitment in buyer - supplier relationships has a strong relationship with partnership and suppliers integration and ultimately chain integration.


Tait (1998) suggested organizations that regard relation with supplier as a priority, are attracting better financial performance and more customer satisfaction.


Detoni and Nassimbeni (1999) found organizations that are successful in performance, refer more long-term supply agreements.

Klein et al (2007) more mutual trust leads to more customization of information technology and strategic information flow.

Sheu et al (2008) found long-term trend affects the information architecture.

Chen and Paulraj (2008) found a significant relationship between long-term relationships with suppliers and sharing information found.

3. Research framework and hypotheses

Figure 1 shows the research model. Six stated hypotheses created the model. Our model makes relation between long-term relationships, logistics integration, information integration and performance. This model comprise of three components of supply chain integration applied by Handfield and Nichols (1999), these elements include information flow, material and product flow and long-term relationship.

H1. Bahaman group’s logistics integration has a positive relationship with its operational performance.

H2. Information technology capacities between Bahaman group and its suppliers have a positive relationship with logistics integration.
H3. Information sharing between Bahaman group and its suppliers has a positive relationship with its logistics integration.

H4. Long term relationship with suppliers has a positive relationship with information technology between Bahaman group and its suppliers.

H5. Long term relationship with suppliers has a positive relationship with information sharing between Bahaman group and its suppliers.

H6. The long term relationship with suppliers has a positive relationship with performance in Bahaman group.

4. Methods
Data of this study were collected through a questionnaire distributed among managers and staff of supply chain, purchasing and logistics, information technology and customer service department of Bahman group. Since population was available and due to ease of data collection, no sampling method was used. In this study, with collecting library resources, research variables were examined. Cronbach's alpha coefficients were calculated separately for each criterion is given in Table 1. Since the coefficients obtained are higher than 70%, it can be said that the questionnaire had acceptable reliability. 120 questionnaires were distributed, among which 75 questionnaires were usable. In other words, 62.5% responded to questions. Of these, 32 of who answered the questionnaire (42.6%) owned by Supply Chain and Procurement, 43 were (57.3%) owned by the customer service and IT sectors, respectively. 62 respondents (82.7%) were male and 13 (17.3%) of the data were female. The lowest percentages were between 40 to 50 years old and most of the samples were between 30 to 40 years. Questions used in this study have been taken from the study of Prajogo & Olhager (2012). A seven point Likert scale was used for each item. The variables of long-term relationship, information technology and information sharing, logistics integration scale from were graded 1 (extremely disagree) to 7 (extremely agree). The quality of production, delivery, flexibility and cost were used as operational performance measures. Respondents were asked to respond in comparison to the best rival in the automotive industry. For the performance, our scales were included 1 (weakest in the industry) to 7 (strongest in the industry).

5. Data analysis
We used confirmatory factor analysis to simultaneously validate the measures of all variables used in this study. The item loadings and the overall model fit results suggest acceptable unidimensionality and convergent validity for the measures. This study also examined the technique of path analysis to test the hypothesis and the universality of model. Since with using path analysis and structural equation, all model and assumptions tested together, the results are presented in figure 2. All hypotheses except hypothesis 6 at significance level of 5% were approved. The final model by deleting the unconfirmed hypothesis can be seen in figure 3.

6. Discussion and conclusion
This study contributes to the research stream on logistics integration by investigating the relationships between long term relationships, information integration, logistics integration, and competitive performance. It demonstrates that the integration of material flow needs to be underpinned by information integration. In this way, the supply chain (material flows from suppliers) will be neatly guided by the demand chain (information flows from customers). This study also highlights the need for observing the two aspects of information integration which have been addressed separately in previous studies on supply chain. This study demonstrates that long term supply chain relationships help foster collaborative behaviors which are translated into various forms, including information integration. As mentioned earlier, information integration cannot be achieved unless the relationship between supply chain partners goes beyond trading (transactional) relationships.

So the results show that:

According to first hypothesis, there is a positive and direct relationship between logistics integration and performance in Bahman group. This hypothesis was confirmed at significance level of 5% . In this respect our findings are align with Prajogo & Olhager (2012), Frohlich and Westbrook (2001), Sheu et al (2006), Li et al (2009).

According to second hypothesis, there is a positive and direct relationship between information technology capacities and logistic integration in Bahman group. This hypothesis was confirmed at significance level of 5%. In this respect our findings are align with Prajogo & Olhager (2012), Sheu et al (2006), Kelle and Akbulut (2005).
In accordance with third hypothesis, there is a positive and direct relationship between information sharing and logistic integration in Bahman group. This hypothesis was confirmed at significance level of 5%. In this respect our findings are align with Prajogo & Olhager (2012), Koçoglu et al (2011).

According to fourth hypothesis, there is a positive and direct relationship between information sharing and long term relationship in Bahman group. This hypothesis was confirmed at significance level of 5%. In this respect our findings are align with Prajogo & Olhager (2012), Sheu et al (2008), Poulraj (2008).

In accordance with fifth hypothesis, there is a positive and direct relationship between information technology capacities and long term relationship in Bahman group. This hypothesis was confirmed at significance level of 5%. In this respect, our findings are align with Prajogo & Olhager (2012), Sheu et al (2008).

Last hypothesis wasn’t proved. It means there is not any direct relationship between long term relationship and performance in Bahman group. Our findings are aligning with B.Flynn et al (2010).

The results show that long-term relationships with suppliers will improve performance but in a different way. It should be noted that, in this study, long-term direct impact on operational performance has been rejected while the importance of this factor in improving performance remains strong. Long-term relationships indirectly and through information technology and information sharing, and then logistics integration are effective for operational performance. As mentioned in literature, information sharing and information technology are suggested as a key argument in success of logistic integration so it is recommended automotive industries specially Bahman group focus more on IT capacities and information sharing to improve its performance. More attention to key suppliers is another recommendation that manufacturing industries should concentrate on.

Future research may extend this study to a broader population of firms, including other countries, for generalizability of the results and to detect potential country effects. Also, in this study we rely on the perception of the focal firm on the relationships. It would be beneficial to investigate multiple parties of supply chain relationships to hear “both sides of the story” concerning issues of reciprocity and mutual effects.

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**Table 1.** Cronbach’s alpha
Figure 3: Final model

- Long term relationship
- Information technology
- Information sharing
- Logistic integration
- Performance

Links:
- Long term relationship to Information technology: 0/19
- Information technology to Logistic integration: 0/31
- Logistic integration to Performance: 0/39
- Information sharing to Logistic integration: 0/40
References: