Journal of Empirical Research in Accounting & Auditing
ISSN (2384-4787)
J. Emp. Res. Acc. Aud. 4, No. 1 (April-2017)

The Effect of Supply Chain Management Practices on Financial Performance via Analytic Hierarchy Process

Fadhel Hilal[1] & Sawsan Hilal[2]

[1]*Researcher in Investment Company*

[2]*Department of Mathematics, College of Science, University of Bahrain*

Received: 6 Jan. 2017, Revised: 27 Feb. 2017, Accepted: 27 Mar. 2017, Published: ***(April 2017)***

Abstract: The effect of supply chain management practices on the operational performance of an organization has been extensively investigated in literature. Comparatively, few studies gave attention to the effect of these practices on the organization's financial performance. This apparent deficiency in literature and particularly for developing countries motivated the current study which aims at examining the effect of supply chain management practices on financial performance of the manufacturing and service organizations in the Kingdom of Bahrain. The comparison between these alternatives was designed by composing multi-criteria decision making of supply chain management practices in order to improve financial performance of the organization. To deal with the complexity of the intended comparison, the analytic hierarchy process has been implemented. The relevant data were collected from two manufacturing organizations and two service organizations using a self-administered questionnaire that has been specifically developed by the researchers to address study objectives along with a planned interview to gather more detailed information about the selected organizations. The corresponding results showed that accurate forecasting of demand management has the highest priority weight in both alternatives. Moreover, inventory management was found to be the second highest important practice with respect to manufacturing-supply chain while it was the least important practice when service-supply chain is concerned. Furthermore, collaboration seems to be more important than integration in both alternatives. An implication of these results is that manufacturing as well as service organizations can increase their financial performance by using identified supply chain practices.

Keywords: Analytic Hierarchy Process, Financial Performance, Manufacturing-Supply Chain, Service-Supply Chain, Supply Chain Management Practices.

Introduction

Over the past two decades, more managers have realized the strategic importance of supply chain management (SCM) and recognized the distinctive competitive advantages that a well-managed supply chain (SC) can bring to the organization. Then it is not surprising that SCM has attracted substantial investments across various industries. Accordingly, managers are requested not just to know whether SCM is able to make positive contributions to the firm-level financial performance, but also to direct their SC investments for enhancing competitive advantages and optimizing financial outcomes. Therefore, managers are obliged to demonstrate the positive financial contributions of SCM and justify the relevant expenses (Shi & Yu, 2013).

In academia, some articles with diverse research designs have been published in various fields to examine the financial effect of SCM. While few studies seem to establish significant relationship between SCM and financial performance, others are not conclusive. The fragmented findings on the financial effect of SCM call for research attention due to the critical role that financial performance plays in various situations such as setting objectives, allocating resources, and determining future directions. Most of the previous studies, however, focused on the operational performance measures of SCM such as delivery performance and customer satisfaction. On the other hand, there

E-mail: Fadhel_jh@hotmail.com, shilal@uob.edu.bh

are comparatively few studies that investigated the effect of SCM on financial performance. Moreover, these studies lack consistency in their results (Ketchen & Giunipero, 2004). Furthermore, most of the previous studies investigated supply chain management practices in developed countries, while less attention has been paid to the developing countries in general and to Bahrain in particular.

Significance of the Study

To the best of our knowledge, this is the first study conducted in the Kingdom of Bahrain to examine the effect of SCM practices on financial performance of both manufacturing organizations and service organizations. This is achieved by composing multi-criteria of SCM in order to find their effect on financial performance of the manufacturing as well as service organizations. To deal with this complexity of the multi-criteria decision making process, analytic hierarchy process (AHP) is utilized. Analyzing this crucial relationship is expected to help managers in both manufacturing and service organizations in taking critical decisions which will eventually enhance financial performance of the organization either by cutting costs through removing non-value added activities or by increasing revenues via good prioritization of the SCM practices.

Consequently, this study has the following research questions: (1) How to analyze SCM practices? (2) How to measure financial performance? (3) How to explore the relationship between SCM practices and financial performance? (4) How to enhance financial performance with the prioritization of the SCM practices through AHP technique?

Scope and Limitation of the Study

This study focuses on examining the effect of SCM practices on financial performance of two manufacturing and two service organizations in the Kingdom of Bahrain via applying the AHP technique. Thus, results of this study may not be appropriate for other countries that have different operation processes nor for other organizations with different management styles in the same country.

The remainder of this paper is organized as follows. The next section provides a survey of the related literature. Section 3 details the research methodology. Section 4 presents the results along with the discussion. Section 5 concludes, summarizes the practical implications of the study findings and highlights some directions of improvement.

Literature Review

Prior to examining the roles that SCM plays in the financial success of an organization, the researchers settled on a definition for SCM. While it has been noted that there is little consensus on a definition for SCM (Burgess, et al., 2006), one of the popular academic definitions is given by Mentzer et al. (2001) and states that SCM is the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.

The effect of SCM extends beyond reducing costs (Ellram & Liu, 2002) and it has been suggested that excellence in managing supply chains is directly linked to superior organizational performance (D'Avanzo, et al., 2004). Whilst the importance of SCM is understood, its effect on organizational financial performance is less clear (Frohlich & Westbrook, 2001). An organization's profitability is the surplus of the revenue generated from sales (price) less costs. Supply chains can improve both price through increased service levels and costs by reducing operating expenditure. SCM creates differentiation through the customer value that is created by superior service (Christopher & Peck, 2003). Furthermore, there is a positive relationship between levels of service and sales volume and customer retention (Ray, et al., 2004). This relationship indicates that supply chain improvements must have the aim of reducing costs without negatively affecting customer service or improving service without a disproportionate increase in costs. Initiatives that reduce the organization's cost base will also contribute in delivering a positive effect in terms of profitability.

Central to SCM is the development of appropriate relationships with both customers

and suppliers (Groves & Valsamakis, 1998). The long-term and mutual beneficial relationships between suppliers and customers indicate that the partnership-concept supports are often contrasted with the traditional adversarial approach to supplier-customer relationships (Saunders, 1994). However, these contrasting models cannot capture the whole range of possible relationships between supply chain members. Confusing perceptions about true co-operative relationships have been identified (Ellram & Krause, 1994) and even the potential for true partnerships is questioned (Shaw & Gibbs, 1995). Empirical research about the effects of different types of relationships on a company's performance is needed. Harland (1995), among others, indicated that more quantitative research about such relationships is needed and specifically for industrial situations.

On the basis of the study objectives, the literature review is divided into two parts: supply chain management practices and financial performance which are discussed in detail below.

Supply Chain Management Practices

The effect of SCM is undoubtedly an in demand area for research. However, it is described by opposing outcomes leading to uncertainty among researchers. In addition, this area of research is mainly the center of attention of organizations in developed countries. Organizations in developing countries suffer an actual phase to enhance their equipped capacities, together with SCM in order to enable them to participate and stay alive in today's competitive business landscape. Competition has radically expanded throughout the previous two decades (Abdallah, et al., 2014). Moreover, previous studies gave attention to diverse SCM practices (Kumar & Nambirajan, 2013). In what follows, a detailed discussion of four SCM practices, namely, demand management, integration, collaboration, and inventory management is given.

Demand Management

The demand management practice focuses on meeting the needs of customers rather than the production process. Nowadays, organizations are more familiar with enhanced SCM which forms the basis for competitive advantage. Consequently, many have rationalized buying and logistics purposes into SCM associations. Information flows from the client first as the foundation. If value is to be added, after that the client has to wish the commodities. Therefore, the client ought to truthfully be the information basis (Sherer, 2005). Where the demand management has inadequate records of qualifying ranges, the representative of that range will require reevaluation (Boon-itt & Pongpanarat, 2011). The demand management is further subdivided into demand accurate forecasting (Taylor, 2011) and demand volatility (AlVarenga, 2014). Firstly, efficient SCM relies on accurate demand forecasting. Typically, forecasts are required at frequent intervals for many items. Forecasting methods suitable for this application are those that can be relied upon to produce robust and accurate predictions when implemented within an automated procedure. Although the analysis indicated that using the same method for all series in a cluster can lead to improved accuracy, a major issue remains as to how to select a method for each cluster. Using cross-validation to select methods for a cluster did not lead to results that were better than the best of the individual methods (Taylor, 2011). Secondly, SCM is now a common topic of conversation among chief managers. Due to the challenges in demand volatility, this subject is put at the very top of most companies' agendas. However, this is not just a leading practice but a necessary one for those firms wishing to get the most from their investments while correctly responding to the complex spectrum of financial and risk challenges they face today (AlVarenga, 2014).

Integration

This practice is represented by developing a single information network that enables all members to share data securely. The integration of supply chains has been found to raise the connections within each part of the chain which in turn gives a superior management to obtain the entire portions of the chain to interrelate in a further well-organized method to generate SC visibility and recognize bottlenecks (Putzger, 1998). The integration of business processes from ultimate consumer throughout innovative

suppliers that offer products and information that add value for clients (Cooper, et al., 1997). This is useful in enhancing a model for connecting the organization's supply chain integration strategy to its competitive strategy, and recognizing connection to the development of managerial performance (Kim, 2006). The integration is further subdivided into internal and external (Handfield, et al., 2015). On one hand, the synergistic effects are derived through strong internal lines of communication. The underlying set of requirements is to achieve supply management alignment, thereby enhancing our understanding of the processes and behaviors required for the integration of internal stakeholder needs (Handfield, et al., 2015). On the other hand, combined external supply relationships are based on defined metrics and processes. The external suppliers can lead to performance improvement. The complementary effects of supply management alignment are on network agility and supplier performance improvements. However, the cross-sectional nature of the data means that the study is not able to test causal inferences regarding the relationship between strategic purchasing, supplier development, and the outcomes on supply base agility and buyer performance improvement (Handfield, et al., 2015).

Collaboration

This practice is described as an emotional, volitional, joint shared process with more departments' team up to have a universal vision, allocate resources, and attain communal objectives (Schrage, 1990). Collaboration with external SC bodies impacts internal collaboration which may enhance service performance. The success of collaboration relies on the willingness of managers to construct significant relationships and create trust. Collaboration facilitates partners to decrease costs and permits inventory to cycle throughout clients faster. whitout an enthusiasm to cooperate, SC will not be competent to reach minimum costs and maximum returns on investment (Fawcett, et al., 2008). The collaboration is further subdivided into reduced development costs and reduced lead time (Tseng & Abdalla, 2006). The collaborative product design and development environment are from a holistic perspective that facilitates virtual multidisciplinary activities. The approach accomplishes a distributed collaborative product development strategy and user-centered environment. The developed system has been tested, with results showing the major benefit of reduced development costs (Tseng & Abdalla, 2006) and also with results showing major benefit of reduced lead time. The tangible benefit of implementing this system is that the complex product developing process is organized in a systematic, consistent, and concurrent manner to enable collaboration among team members throughout the development process. It accomplishes a guiding sequence that assists inexperienced users to follow the complex process. Moreover, one of the advantageous features of this system is that the barriers between people and incompatible computer systems, resulting from non-standardization, have been eliminated (Tseng & Abdalla, 2006).

Inventory Management

This practice is represented by controlling the ordering, storage and use of components that a company will implement in the production of the selling items as well as in controlling the quantities of finished products for sale. Inventories that are mismanaged can create significant financial problems for a business. The inventory management is further subdivided into overstocking situation, understocking situation (Ghafour, et al., 2014), and just-in-time (Yang, et al., 2007). Firstly, massive practical real-world applications of an efficient inventory system dictates whether single location or multi-stage location will avoid falling into overstocking situation (Ghafour, et al., 2014). Secondly, enormous practical applications of an efficient inventory system policy will also avoid falling into understocking situation. However, the optimality of inventory and allocation policies in a supply chain is still unknown for most types of multi-stage systems (Ghafour, et al., 2014). Thirdly, inventory management contributes to the success of SCM by minimizing the joint inventory cost. The joint inventory cost and the response time can further be reduced when the buyer orders and the vendor replenishes the required items just-

in-time (JIT) for their consumption (Yang, et al., 2007).

Financial Performance

The financial performance of a company is described as how well the company attains its financial objectives (Deshpande, 2012). The financial objectives have broadcast accounting variables to gauge the performance of industrial companies such as return on asset (Yang & Su, 2009). The return on asset is deemed as the major metric for measuring profitability (Karaduman, et al., 2010; Samiloglu & Demirgunes, 2008) in addition to return on equity (Shakoor, et al., 2012), and operational profit margin.

Overview of Analytic Hierarchy Process

The analytic hierarchy process (AHP) was introduced in 1970s. It is defined as a structured method that involves decomposing complex and unstructured elements into a set of components organized in a multi-level hierarchical form (Saaty, 1983). Decision making involves different alternatives, and hence, AHP structures the decision process into a hierarchical form. Then through a set of pairwise comparisons at each level of the hierarchy, a matrix can be developed, where the entities indicate the dominate elements with respect to a given criterion. The main concern of AHP is dealing with inconsistencies arising from the judgment and improving this judgment (Vinodh, et al., 2011). AHP judges and selects the elements which have greater influence on the predetermined objective. AHP has mostly been used to accurately evaluate the effect of SCM practices in terms of goals.

Synthesis of the Study

Previous studies mainly investigated SCM practices at manufacturing organizations in developed countries. Others also found relationship between SCM practices and SC performance via traditional statistical tests such as correlations and regressions.

The researchers of this study evaluate the effect of SCM practices on financial performance of both manufacturing and services organizations in a developing country, Kingdom of Bahrain, via the AHP technique.

Similarities

All previous studies confirmed the important role of well-managed SC practices of any successful organization to survive in today's tough competitions.

Differences

The current study conducts data from both manufacturing and service organizations in the Kingdom of Bahrain through the AHP technique. On the contrary, most of the previous studies conducted data from manufacturing companies only, and in developed countries.

Research Methodology

This study is a qualitative research that aims at improving financial performance of the manufacturing and service organizations through the implementation of efficient SCM. A brief description for these alternatives is given in Table 1.

Table 1. Manufacturing-SC and Service-SC

Manufacturing-Supply Chain
It is a virtual and universal supply chain that encompasses three functions: (1) supply of materials to a manufacturer, (2) the manufacturing process, and (3) the distribution of finished goods through a network of distributors and retailers to a final customer. An example of this SC is the aluminum smelting which is defined as the process of extracting aluminum from its oxide alumina. Alumina is extracted from the ore bauxite by means of the Bayer process at an alumina refinery.
Service-Supply Chain

This supply chainenables serviceorganizations to improve customer satisfaction and reduce operational costs through intelligent and optimized forecasting, planning and scheduling of the service chain and its associated resources such as people, networks, information and other assets.
The educational bodies such as universities represent an example of this SC. Universities create economically valuable intellectual resources. It assumes that the function of universities is to provide direct in-out benefits for society's economic prosperity. The logic implies that invention in the university, largely in its science labs, leads to innovation and economic benefit

Research Model

The adopted research model is built on a hierarchical basis through the implementation of AHP to prioritize financial performance of the organization. In general, AHP comprises four phases (Tummala & Wan, 1994): structuring the decision problem, data collection and measurement, determination of normalized weights and synthesis, and finding solutions to the problem. Then by using this four-phase approach, the researchers formulated an AHP model for the effect on financial performance through SCM that could be applied to both manufacturing and service organizations. This approach classifies the goal and all relevant decision criteria, sub-criteria and variables into four major levels as shown in Figure 1.

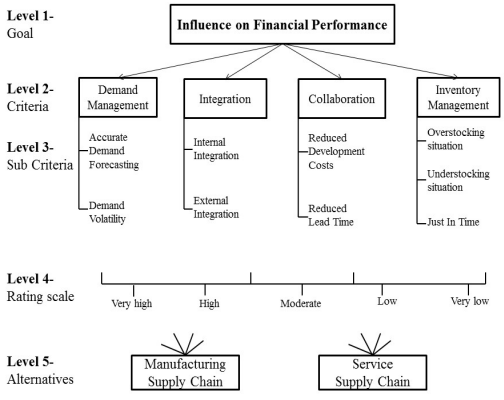

Figure 1. AHP Model

The highest level of the hierarchy signifies the overall goal which is represented by identifying the improved financial performance of the manufacturing and service organizations. Level 2 specifies the main criteria used to represent SCM practices. Specifically, four criteria (demand management, integration, collaboration, and inventory management) have been selected for measuring SCM (Sherer, 2005; Kim, 2006; Fawcett, et al., 2008). Level 3 consists of the sub-criteria underneath each of the four selected criteria. More specifically, demand accurate forecasting and volatility have been considered for the demand management criterion. Both internal and external integration have been taken into account, while reduced development costs and lead time have been considered for the collaboration criterion. With regard to the inventory management criterion, then overstocking situation, understocking situation, and just-in-time have been considered. Level 4 consists of the decision alternatives that affect the ultimate selection of SCM. In this study, two alternatives of supply chain (manufacturing-supply chain and service-supply chain) have been chosen.

Data Collection and Processing

Once the decision problem was structured and the corresponding research model was built, the relevant data have to be collected. In particular, data were collected from two manufacturing organizations (aluminum smelters) and two service organizations (private universities). It is worth mentioning that AHP technique uses a small purposive sample due to survey conduction with the key manager only of each organization to investigate the relationships of interest.

Then, as suggested by Saaty (1983), a questionnaire was designed on a nine-point scale based on the adopted research model. The questionnaire was pilot-tested using industry experts and academics that have sufficient experience and knowledge about SCM. The received feedback was incorporated into the revised version of the questionnaire to ensure its validity and some of its items have been rephrased accordingly. Moreover, for each of the selected manufacturing organizations two

officers (production managers and accounting managers) were interviewed. Similarly, for each of the selected service organizations four officers (accounting manager, purchasing manager, audit manager, and property manager) were interviewed.

Next, the pairwise comparisons between and within the implemented criteria have to be determined. Saaty (1983) suggested a nine-point scale, as shown in Table 2, for defining pairwise comparisons. For clarity, consider an organization which identifies quality as "strongly" more important than cost, then the former is rated "5" and the latter "1/5".

Table 2. The Fundamental Scale for Pairwise Comparisons

Index	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance	Judgment slightly favors one activity over another
5	Strong importance	Judgment strongly favors one activity over another
7	Very strong importance	An activity is favored very strongly over another
9	Extreme importance	The highest possible order of affirmation
2, 4, 6, 8	Intermediate values	Compromise between the priorities listed above

Moreover, the consistency of responses is measured by the consistency index (CI) which is defined by Saaty (1983) as

$$CI = (\lambda_{i_{max}} - n) / (n - 1),$$

where, $\lambda_{i_{max}}$ is the maximum eigenvalue of the matrix of the importance ratios and n is the number of factors in the questionnaire. Then the consistency ratio (CR) is used to assess whether the matrix is sufficiently consistent or not. It represents the consistency index of the matrix of comparisons generated randomly and defined as CR = CI / RI,

where RI denotes the random index. The random pairwise comparisons have been simulated to produce average random indices for different sized matrices. The values of RI are given in Table 3. The inconsistency is acceptable if CR does not exceed 0.10 (Saaty, 1983).

The researchers elected to use the geometric mean approach, as suggested by Saaty (1990), in order to combine the individual pairwise-comparison judgment matrices to obtain the consensus pairwise-comparison judgment matrices for the entire team.

Table 3. The Random Index

n (number of factors)	RI
1	0.00
2	0.00
3	0.52
4	0.89
5	1.11
6	1.25
7	1.35
8	1.40
9	1.45
10	1.49

Results and Discussion

The effect of SCM practices on the financial performance of the selected organizations was analyzed for both alternatives: manufacturing-supply chain and service-supply chain, wherein each SCM practice is further divided into sub-criteria for each alternative. Moreover, the consistency and reliability of data were confirmed by calculating CR. Finally, a comparison for the overall priority weight has been made.

Analysis of Manufacturing-SC

This section presents the results obtained from analyzing the four SCM practices (demand management, integration, collaboration, and inventory management) in the manufacturing organizations. The results (reported in Table 4) show that demand management has the highest priority weight with 45%, then inventory management with 36%, and collaboration

with 14%, while integration has the least priority weight with 6% only. These results support lean production that mainly focuses on customer demand request which makes demand management the most important criterion. Moreover, inventory management comes in second place since manufacturing organizations spend huge amount in inventories. Finally, the results indicate that collaboration is more important than integration to improve financial performance of the manufacturing organizations.

Table 4. The Geometric Means of Pairwise Comparisons for Manufacturing-SC

Criterion	DM	I	C	IM	Priority Weight
DM	1.00	5.50	4.00	1.50	0.45
I	0.18	1.00	0.29	0.18	0.06
C	0.25	3.45	1.00	0.27	0.14
IM	0.67	5.56	3.70	1.00	0.36
CR = 0.06 < 0.10 (acceptable)					
DM: Demand Management, I: Integration, C: Collaboration, IM: Inventory Management					

With respect to the analysis of demand management sub-criteria, then results (reported in Table 5) show that demand accurate forecasting has substantially higher priority weight (88%) than demand volatility (12%). In other words, manufacturing organizations give more attention to demand accurate forecasting rather than trying to avoid demand volatility in order to improve their financial performance. The reason behind this approach is that accurate forecasting will dramatically cut costs by removing all non-value added activities that will eventually increase the profitability of the organization.

Table 5. The Geometric Means of Pairwise Comparisons for Demand Management in Manufacturing-SC

Criterion	Demand		Priority Weight
	Accurate Forecasting	Volatility	
Accurate Forecasting	1.00	7.50	0.88
Volatility	0.13	1.00	0.12
CR = 0.00 < 0.10 (acceptable)			

When the analysis of integration sub-criteria is concerned, then the corresponding results (collected in Table 6) show a very high priority weight (71%) for the internal integration compared to the external integration. This highlights the significant role that internal integration plays in enhancing financial performance of the manufacturing organizations.

Table 6. The Geometric Means of Pairwise Comparisons for Integration in Manufacturing-SC

Criterion	Integration		Priority Weight
	Internal	External	
Internal	1.00	2.50	0.71
External	0.40	1.00	0.29
CR = 0.00 < 0.10 (acceptable)			

The results obtained from analyzing collaboration sub-criteria are collected in Table 7. They show that reduced development cost has high priority weight (80%) compared to reduced lead time (20%). This seems to indicate that manufacturing organizations, in their intention to enhance their financial performance, focus more on direct cut cost by reduced development cost than indirect cut cost by reduced lead time.

Table 7. The Geometric Means of Pairwise Comparisons for Collaboration in Manufacturing-SC

Criterion	Reduced		Priority Weight
	Development Costs	Lead Time	
Development Costs	1.00	4.00	0.80
Lead Time	0.25	1.00	0.20
CR = 0.00 < 0.10 (acceptable)			

The results obtained from analyzing inventory management sub-criteria are collected in Table 8. It was found that just-in-time has the highest priority weight with 56%, then understocking situation with 34%, leaving overstocking situation with the least priority weight (10%). This ranking means that manufacturing organizations consider just-in-time inventory as the most important

sub-criterion relative to understocking and overstocking situations in terms of financial performance improvement. It is also worth noting that understocking is riskier than overstocking since the former situation causes failure to deliver requests on time and may lead to lose customers which will eventually reduce profitability of the organization (Jatau, et al., 2015).

Table 8. The Geometric Means of Pairwise Comparisons for Inventory Management in Manufacturing-SC

Criterion	Over stocking	Under stocking	Just in Time	Priority Weight
Over stocking	1.00	0.23	0.21	0.10
Under stocking	4.35	1.00	0.50	0.34
Just in Time	4.76	2.00	1.00	0.56
CR = 0.05 < 0.10 (acceptable)				

Finally, the results (represented graphically by Figure 2) with respect to the global priority weight of all sub-criteria for manufacturing organizations show that demand accurate forecasting has the highest priority weight with 40%, just-in-time comes second with 20%, then understocking situation with 12%, reduced development costs with 11%, demand volatility with 5%, internal integration and overstocking situation with 4% each, reduced lead time with 3%, and finally external integration with the least global priority weight (2%).

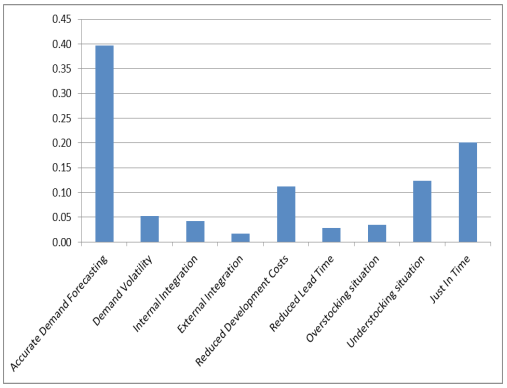

Figure 2. The Global Priority Weight in Manufacturing-SC

Analysis of Service-SC

This section presents the results obtained from analyzing the four SCM practices (demand management, integration, collaboration, and inventory management) in the service organizations. The results (reported in Table 9) show that demand management has the highest priority weight with 39%; then collaboration with 26%; and integration with 19%; while inventory management has the least priority weight with 15% only. In light of these results, service organizations give their attention to demand management in the first place. Next, they try to cut cost by collaboration and focus on integration while paying less attention to inventory management. The latter result is probably due to the existence of few inventories in service organizations that in turn will enhance their financial performance.

Table 9. The Geometric Means of Pairwise Comparisons for Service-SC

Criterion	DM	I	C	IM	Priority Weight
DM	1.00	2.00	1.50	2.50	0.39
I	0.50	1.00	0.75	1.25	0.19
C	0.67	1.33	1.00	1.75	0.26
IM	0.40	0.80	0.57	1.00	0.15
CR = 0.00 < 0.10 (acceptable)					
DM: Demand Management, I: Integration, C: Collaboration, IM: Inventory Management					

With respect to the analysis of demand management sub-criteria, then results (collected in Table 10) show that demand accurate forecasting has substantially higher priority weight (85%) than demand volatility (15%). This means that service organizations give more attention to accurate forecasting rather than trying to avoid demand volatility in order to improve their financial performance. This finding comes in line with the one reported for the manufacturing organizations.

Table 10. The Geometric Means of Pairwise Comparisons for Demand Management in Service-SC

Criterion	Demand		Priority Weight
	Accurate Forecasting	Volatility	
Accurate Forecasting	1.00	5.75	0.85
Volatility	0.17	1.00	0.15
CR = 0.00 < 0.10 (acceptable)			

When the analysis of integration sub-criteria is concerned, then the corresponding results (collected in Table 11) show a very high priority weight (79%) for the internal integration compared to the external integration. Interestingly, similar results were reported for the manufacturing organizations.

Table 11. The Geometric Means of Pairwise Comparisons for Integration in Service-SC

Criterion	Integration		Priority Weight
	Internal	External	
Internal	1.00	3.75	0.79
External	0.27	1.00	0.21
CR = 0.00 < 0.10 (acceptable)			

The results obtained from analyzing collaboration sub-criteria are collected in Table 12. They show that reduced lead time has high priority weight (78%) compared to reduced developed costs (22%). These results contrast what have been found in the case of manufacturing organizations.

Table 12. The Geometric Means of Pairwise Comparisons for Collaboration in Service-SC

Criterion	Reduced		Priority Weight
	Development Costs	Lead Time	
Development Costs	1.00	0.28	0.22
Lead Time	3.57	1.00	0.78
CR = 0.00 < 0.10 (acceptable)			

The results obtained from analyzing inventory management sub-criteria are collected in Table 13. It was found that just-in-time comes in the first place with priority weight of the 64%, then understocking situation with 22% and finally overstocking situation with 13%. Therefore, the inventory management sub-criteria are ranked in a similar manner by both manufacturing and service organizations.

Table 13. The Geometric Means of Pairwise Comparisons for Inventory Management in Service-SC

Criterion	Over stocking	Under stocking	Just in Time	Priority Weight
Over stocking	1.00	0.46	0.26	0.13
Under stocking	2.17	1.00	0.26	0.22
Just in Time	3.85	3.85	1.00	0.64
CR = 0.09 < 0.10 (acceptable)				

Finally, the results (represented graphically by Figure 3) with respect to the global priority weight of all sub-criteria for service organizations show that demand accurate forecasting has the highest priority weight with 33%, reduced lead time comes second with 20%, then internal integration with 15%, just-in-time with 10%, demand volatility and reduced development costs with 6% each, external integration with 4%, understocking situation with 3%, and finally overstocking situation with the least global priority weight (2%).

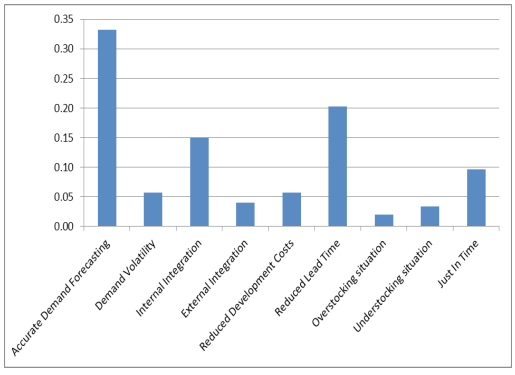

Figure 3. The Global Priority Weight in Service-SC

Overall Priority Comparison

As long as the overall priority comparison is concerned, then consistency in results between manufacturing-supply chain and service-supply chain has been realized (Figure 4) in the sense that demand management reserves the highest priority weight in both alternatives. This finding supports the importance of matching customers' demand request with production process of the lean production rather than just commence production that may cause high wastage, storing costs, and obsolescence.

Moreover, as displayed in Figure 4, inventory management has the second highest priority weight in the manufacturing-supply chain (36%) while it was marked with the least priority weight in the service-supply chain (15%). This contrast can be explained by the fact that manufacturing organizations heavily depend on inventories for their production whereas service organizations usually use few inventories.

On the other hand, collaboration has the third highest priority weight in manufacturing-supply chain (14%) and the second highest priority weight in the service-supply chain (26%). This is common sense because service organizations depend heavily on collaboration to cut costs.

With respect to the integration practice, it has the least priority weight in the manufacturing-supply chain (6%) and the third highest priority weight in the service-supply chain (19%).

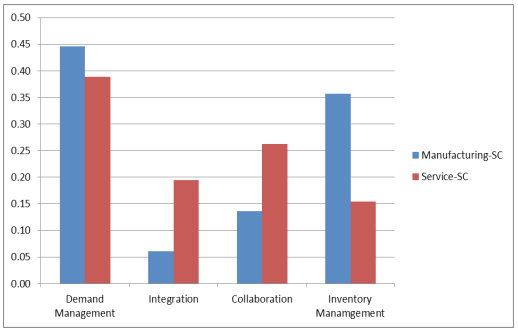

Figure 4. The Overall Priority Weight between Manufacturing-SC and Service-SC

Conclusion

This study presents a detailed analysis for the effect of supply chain management on financial performance of both manufacturing and service organizations through the implementation of the analytic hierarchy process to be the first research conducted in the Kingdom of Bahrain with this regard. Therefore, a valuable contribution of the conducted research is providing a practical implication on how to enhance financial performance of the organization by properly prioritizing supply chain management practices.

A 5-level analytic hierarchy model with four different practices of supply chain management along with their sub-criteria has been presented and analyzed using data from two manufacturing and two service organizations. The reported results indicated that demand management comes as the top priority once financial performance of the organization is concerned. Interestingly, the inventory management practice has the second importance in relation to the manufacturing-supply chain but the least importance in relation to the service-supply chain. On the other hand, collaboration is more important than integration in both alternatives with higher weight for these practices in the service-supply chain compared to manufacturing-supply chain.

Moreover, demand accurate forecasting is the most important sub-criteria for enhancing financial performance of manufacturing or service organizations. The results signified just-in-time criterion with the highest effect in enhancing financial performance of the organization than other inventory management criteria. Furthermore, internal integration was found to be more important than external integration in both alternatives. The results indicated that manufacturing organizations look for reducing development costs, while service organizations look for reducing lead time to enhance their financial performance.

In light of the study findings, it is recommended to draw attention to the demand management practice due to its vital role in any successful organization. The results indicate that enhancing financial performance of the organization can be achieved by giving the

highest attention to demand accurate forecasting. This is the case for both manufacturing and service organizations.

It is worth mentioning that the reported results were derived from two manufacturing organizations and two service organizations only. Consequently, these results may not fit with other organizations that differ in size and/or nature of business, and so they cannot be generalized. Future research with a larger sample size to cover a variety of manufacturing and service organizations is needed to support results' validity and generalizability.

References

Abdallah, A. B., Obeidat, B. Y., and Aqqad, N. O. 2014, The Impact of Supply Chain Management Practices on Supply Chain Performance in Jordan: The Moderating Effect of Competitive Intensity, International Business Research, Vol. 7, No. 3, pp. 13-27.

AlVarenga, C. A. 2014, The Operations Centered CFO: Reinvesting the Role of Finance in Supply Chain Management, Corporate Finance Review, pp. 16-23.

Boon-itt, S., and Pongpanarat, C. 2011, Measuring Service Supply Chain Management Processes: The Application of the Q-Sort Technique', International Journal of Innovation, Management and Technology, Vol. 2, No. 3, pp. 217 - 221.

Burgess, K., Singh, P., and Koroglu, R. 2006, 'Supply Chain Management: A Structured Literature Review and Implications for Future Research, International Journal of Operations and Production Management, Vol. 26, No. 7, pp. 703-729.

Christopher, M., and Peck, H. 2003, Marketing Logistics. Oxford: Butterworth Heinemann.

Cooper, M. C., Lambert, D. M., and Pagh, J. D. 1997, Supply Chain Management: More Than a New Name for Logistics, International Journal of Logistics Management, Vol. 8, No. 1, pp. 1-14.

D'Avanzo, R., Starr, C., and von Lewinski, H. 2004, Supply Chain and the Bottom Line: A Critical Link, Outlook: Accenture, Vol. 1, pp. 39-45.

Deshpande, A. R. 2012, Supply Chain Management Dimensions, Supply Chain Performance and Organizational Performance: An Integrated Framework, International Journal of Business and Management, Vol. 7, No. 8.

Ellram, L. M., and Krause, D. R. 1994, Supplier Partnerships in Manufacturing Versus Non-Manufacturing Firms, The International Journal of Logistics Management, Vol. 5, No. 1, pp. 43-53.

Ellram, L., and Liu, B. 2002, The Financial Impact of Supply Management, Supply Chain Management Review, Vol. 6, No. 6, pp. 30-37.

Fawcett, S. E., Magnan, G. M., and McCarter, M. W. 2008, Benefits, Barriers, and Bridges to Effective Supply Chain Management, Supply Chain Management: An International Journal, Vol. 13, No. 1, pp. 35–48.

Frohlich, M., and Westbrook, R. 2001, Arcs of Integration: An International Study of Supply Chain Strategies, Journal of Operations Management, Vol. 19, No. 2, pp. 185-200.

Ghafour, K. M., Ramli, R., and ZuraZaibidi, N. 2014, A Simulation Approach to Determine the Probability of Demand during Lead-Time When Demand Distributed Normal and Lead-Time Distributed Gamma, Journal of Economics and Behavioral Studies, Vol. 6, No. 11, pp. 840-847.

Groves, G., and Valsamakis, V. 1998, Supplier-Customer Relationships and Company Performance. International, Journal of Logistics Management, Vol. 9, No. 2, pp. 51-64.

Handfield, R. B., Cousins, P. D., Lawson, B., and Petersen, K. J. 201, How Can Supply Management Really Improve Performance? A Knowledge-Based Model of Alognment Capabilities, Journal of Supply Chain Management, Vol. 51, No. 3, pp. 3-17.

Harland, C. M. 1995, Networks and Globalization - A Review of Research. Warwick: Business School.

Jatau, B., Avong, Y., Ogundahunsi, O., Shah, S., Smith, K., Bergh, R., Zachariah, R., Griensven, J., Ekong, E., and Dakum, P. 2015, Procurement and Supply Management System for MDR-TB in Nigeria: Are the Early Warning Targets for Drug Stock Outs and Over Stock of Drugs Being Achieved?, Public Library of Science One, Vol. 10, No. 6.

Karaduman, H. A., Akbas, H. E., and Ozsozgun, A. 2010, Effects of Working Capital Management on Profitability: The Case for Selected Companies in the Istanbul Stock Exchange, International Journal of Economics and Finance Studies, Vol. 2, No. 2, pp. 47 - 54.

Ketchen, D. J., and Giunipero, L. 2004, The Intersection of Strategic Management and Supply Chain Management, Industrial Marketing Management, Vol. 33, No. 1, pp. 51-56.

Kim, S. W. 2006, Effects of Supply Chain Management Practices, Integration and Competition Capability on Performance. Supply Chain Management, An International Journal, Vol. 11, No. 3, pp. 241 – 248.

Kumar, C. G., and Nambirajan, T. 2013, Supply Chain Management Components, Supply Chain Performance and Organizational Performance: A Critical Review and Development of Conceptual Model, International Journal on Global Business Management and Research, pp. 86 - 96.

Mentzer, J., Dewitt, W., Keebler, J., Min, S., Nix, N., Smith, C., and Zacharia, Z. 2001, Defining Supply Chain Management, Journal of Business Logistics, Vol. 22, No. 2, pp. 1-25.

Putzger, I. 1998, All the Ducks in a Row, World Trade, Vol. 11, No. 9, pp. 54-56.

Ray, G., Barney, J., and Muhanna, W. 2004, Capabilities, Business Processes, and Competitive Advantage: Choosing the Dependent Variable in Empirical Tests of the Resource-based View, Strategic Management Journal, Vol. 25, No. 1, pp. 23-37.

Saaty, T. 1983, Priority Setting in Complex Problems, IEEE Transactions on Engineering Management, Vol. EM-30, No. 3, pp. 140-155.

Saaty, T. 1990, 'How to Make a Decision: the Analytic Hierarchy Process', European Journal of Operational Research, Vol. 48, No. 1, pp. 9-26.

Saunders, M. J. 1994, Strategic Purchasing and Supply Chain Management. London: Pitman Publishing.

Schrage, M. 1990, Shared Minds: The New Technologies of Collaboration. New York: Random House.

Shakoor, F., Khan, A. Q., and Nawab, S. 2012, The Inter Linkages of Working Capital and Profitability in Pakistan, Academic Research International, Vol. 3, No. 2, pp. 562-567.

Shaw, S. A., and Gibbs, J. 1995, Retailer-Supplier Relationships and the Evolution of Marketing: Two Food Industry Case Studies, International Journal of Retail and Distribution Management, Vol. 23, No. 7, pp. 7-16.

Sherer, S. A. 2005, From Supply-Chain Management to Value Network Advocacy: Implications for e-Supply Chains, Supply Chain Management, Vol. 10, No. 2, pp. 77-83.

Shi, M., and Yu, W. 2013, Supply Chain Management and Financial Performance: Literature Review and Future Directions, International Journal of Operations and Production Management, Vol. 33, No. 10, pp. 1283-1317.

Taylor, J. 2011, Multi-Item Sales Forecasting with Total and Split Exponential Smoothing, Journal of the Operational Research Society, Vol. 62, No. 3, pp. 555–563.

Tseng, K. C., and Abdalla, H. 2006, A Novel Approach to Collaborative Product Design and Development Environment, in Proceedings of the Institution of Mechanical Engineers, 220(B12), pp. 1997-2020.

Tummala, V., and Wan, Y. 1994, Analytic Hierarchy Process (AHP) in Practice:

A Survey of Applications and Recent Developments, Journal of Mathematical Modelling and Scientific Computing, Vol. 3, No. 1, pp. 1-38.

Vinodh, S., Shivraman, K., and Viswesh, S. 2011, AHP-based Lean Concept Selection in a Manufacturing Organization, Journal of Manufacturing Technology Management, Vol. 23, No. 1, pp. 124-136.

Yang, C., and Su, Y.-f. 2009, The Relationship between Benefits of ERP Systems Implementation and Its Impacts on Firm Performance of SCM, Journal of Enterprise Information Management, Vol. 22, No. 6, pp. 722-752.

Yang, P. C., Wee, H. M., and Yang, H. J. 2007, Global Optimal Policy for Vendor–Buyer Integrated Inventory System within Just In Time Environment, Springer Science+Business Media, Vol. 37, No. 4, pp. 505–511.