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Abstract

Purpose – The purpose of this paper is to theorise and develop seven dimensions (strategic supplier partnership, level of information sharing, quality of information sharing, customer service management, internal lean practices, postponement and total quality management) into a supply chain management (SCM) practices (SCMPs) construct and studies its causal relationship with the conceptualised constructs of supply chain performance (SCP) and manufacturing firms' performance (MFP). The study also explores the causal relationship between SCP and MFP.

Design/methodology/approach – Data were collected through a survey questionnaire responded by 249 Jordanian manufacturing firms. The relationships proposed in the developed theoretical framework were represented through three hypotheses: *H1* – there is a significant relationship between SCMPs and SCP; *H2* – there is a significant relationship between SCMPs and MFP; and *H3* – there is a significant relationship between SCP and MFP. Linear regression, ANOVA and Pearson correlation were used to test the hypotheses. The results were further validated using structural equation modelling.

Findings – The results indicate that SCMPs have a positive effect on SCP (*H1*), which in turn also positively affect MFP (*H3*). Despite this intermediary positive effect of SCMP on MFP through SCP, the study also suggests that SCMPs have a direct and positive effect on MFP (*H2*).

Practical implications – This study provides hard evidence indicating that higher levels of SCMPs can lead to enhanced supply chain and firms' performance. It also provides SC managers of manufacturing firms with a multi-dimensional operational measure of the construct of SCMPs for assessing the comprehensiveness of the SCMPs of their firms.

Originality/value – This study is among the very first SCM researches conducted on the Jordanian manufacturing sector, particularly, in relation to the practices that manufacturing firms in this country need to adopt to make their supply chains a solid competitive vehicle for their development. The results have broader implications for all manufacturing companies, particularly in developing economies where the growth of manufacturing and the development of integrated supply chains are key stages in economic development.

Keywords Performance, Supply chain management, Practices, Manufacturing industry, Supply chain performance, Manufacturing firms' performance

Paper type Research paper

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1. Introduction

Supply chain management (SCM) has nowadays become a crucial strategy for firms to enhance their profitability and stay competitive (Li *et al.*, 2006). Thus, SCM has been recognised as an important phenomenon that has generated extensive interest among managers and academic researchers. Thus, over the last decade, scholars have increased the degree of attention paid to SCM. This has resulted in a rich stream of research, mainly focussed on particular aspects of the field of SCM that include, among others, supplier selection (e.g. Igarashi *et al.*, 2013; Inemek and Tuna, 2009), supplier involvement (e.g. Johnsen, 2011), supplier alliances (e.g. Kannan and Tan, 2004; Lee *et al.*, 2009), supplier management (e.g. Reuter *et al.*, 2010), upstream supply chain-related research (e.g. Oosterhuis *et al.*, 2012; Finne and Holmström, 2013), manufacturer and retailers linkages (e.g. Li and Zhang, 2015), supply chain resilience (e.g. Carvalho *et al.*, 2014), SCM practices (SCMPs) (e.g. Zimmermann and Foerstl, 2014; Li *et al.*, 2005, 2006), sustainable and green supply chains (e.g. Choi *et al.*, 2016; Kumar *et al.*, 2015), etc.

The wide and diverse stream of research conducted into different aspects of SCM may be explained by the interdisciplinary nature of this subject area. Therefore, SCM is considered as a multidisciplinary field that has been explored from many different perspectives (Papakiriakopoulos and Pramatari, 2010). Mainly, the concept of SCM has been considered from two alternative perspectives: purchasing and supply management. These perspectives emphasise purchasing and materials management as a basic strategic business process, rather than a narrow specialized supporting function (Narasimhan *et al.*, 2008; Sandberg, 2007); transportation and logistics management, which focusses on integrated logistics systems (e.g. inventory management, vendor relationships, transportation, distribution, warehousing and delivery services) that lead to inventory reduction both within and across firms in the supply chain (Banomyong and Supatn, 2011; Cook *et al.*, 2011).

However, despite the rich stream of research in this subject area, Cigolini *et al.* (2004) and Li *et al.* (2006) consider that scholarly research has been limited in contributing to the practice of SCM. They have attributed this not only to the interdisciplinary nature of SCM, but also to its evolutionary characteristics, which according to them have created a conceptual confusion in its understanding. Although these factors may have contributed in the creation of a gap between the SCM theory and its applicability to practice, the generic nature of the research conducted may have also played a significant role on this. Thus, studies of the precise SCMPs adopted by specific countries and industries allow their distinctive characteristics to be understood within particular contexts. This, therefore, contributes in bridging the gap between the SCM theory and its application. In this line, various SCM studies have been conducted in various sectors such as automobile (Blos *et al.*, 2009; Zhu *et al.*, 2007), pharmaceutical (Papalexi *et al.*, 2016), toy (Wong *et al.*, 2005), apparel/textile (Abylaev *et al.*, 2014), chemical (Foerstl *et al.*, 2010), telecommunication (Reyes *et al.*, 2002), agriculture/food (Dani and Deep, 2010), aerospace (Sinha *et al.*, 2004), electronics (Blos *et al.*, 2009), construction (Saad *et al.*, 2002), etc. Similarly, studies of various SCM aspects tend to be focussed on developed countries and their interaction with developing economies as sources of supply as well as on some developing nations such as China (Zhu *et al.*, 2007), Brazil (Blos *et al.*, 2009; Diniz and Fabbe-Costes, 2007), Taiwan (Chow *et al.*, 2008) and Kyrgyz Republic (Abylaev *et al.*, 2014). Taken together, these studies present the efforts made by researchers to understand SCMPs within specific industrial and country contexts. However, despite this, there is a lack of studies on SCM in relation to the practices that manufacturing firms in developing countries need to adopt to make their supply chains a solid competitive vehicle for their development. Jordan's economic, political and geographical characteristics as well as its current state of expanding manufacturing sector, and potential gateway to North Africa and the Middle East, makes the supply chains of its manufacturing sector different to all those previously studied (e.g. Zhu *et al.*, 2007; Blos *et al.*, 2009;

Abylaev *et al.*, 2014). Jordan's developing economy dominated by manufacturing SMEs and with limited but developing transport infrastructure, makes it a unique context that demands further investigation. This justifies the opportunity of studying the SCMPs of the Jordanian manufacturing sector, in its own right, for the SCM theory to be able to understand its particular characteristics and in this way contribute to its practice.

The purpose of this study is, therefore, to empirically test a framework identifying the relationships among the SCMPs of Jordanian manufacturing firms, the performance of their supply chains, and the performance of their whole firm. To conduct this study, SCMPs are defined as a multi-dimensional concept, including both sides of the SC (i.e. downstream and upstream). The seven SCMPs considered in this study were developed, tested and validated in the literature by researchers such as Li *et al.* (2006), Green *et al.* (2008), Tan (2002) and Cook *et al.* (2011). These practices are considered crucial, and they cover both upstream and downstream sides of the SC. Using data collected through a survey questionnaire, operational measures developed for the constructs are empirically tested. Inferential statistics and structural equation modelling (SEM) are used to test and validate the hypothesised relationships. This study, thus, aims to help researchers, and specifically, manufacturing firms to better understand the scope and activities associated with their SCMPs that have a prominent role not only on the performance of their SC, but also the entire firm. By considering both sides of the SC, this study allows researchers to test the antecedents and consequences of SCMPs, and also in the context of a specific developing sector and country. The study, therefore, provides a useful guidance for Jordanian manufacturing firms as well as a validated instrument for them to measure and implement SCMPs. The study also contributes to the academic theory by expanding the limited current body of knowledge on SCM in developing countries context (e.g. Li *et al.*, 2006; Min and Mentzer, 2004; Cigolini *et al.*, 2004).

This study aims at addressing the following research questions:

RQ1. What SCMPs apply to manufacturing firms in Jordan?

RQ2. Is there any relationship between the current SCMPs that are adopted by manufacturing firms in Jordan and manufacturing firms' performance (MFP)?

The rest of this paper is organised as follows: Section 2 presents the theoretical research framework and provides a review on the definitions and theory that underline the constructs and dimensions that comprise it; the research methodology and analysis of results are then presented in Sections 3 and 4, respectively; these results are then discussed in Section 5; while Section 6 provides the conclusions derived from this study.

2. Theoretical research framework

Figure 1 illustrates the theoretical research framework developed for this research. The framework allows the understanding of the antecedents and consequences of SCM as described by the causal relationships between SCMPs, SC performance and MFP (see Figure 1). The framework is underlined by the rationale that a high degree of SCMPs will lead to higher levels of SC performance and hence the enhancement of firm's performance. In particular, the framework proposes that SCMPs will not only have a direct impact on firm's performance, but also an indirect effect through SC performance (Li *et al.*, 2006). As a consequence, SCMP is conceptualised through a seven-dimensional construct as indicated in the SCMPs' box in Figure 1, whereas SC and firms' performance are conceptualised through four- and two-dimensional constructs, respectively (see Figure 1). These dimensions were tested and validated by various researchers (Li *et al.*, 2006; Green *et al.*, 2008; Tan, 2002; Cook *et al.*, 2011), and were considered as significant factors that affect MFP.

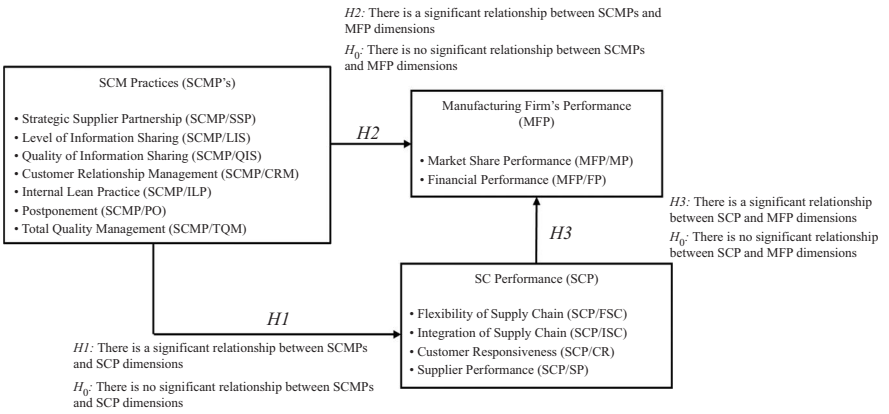

Figure 1.
Research framework

2.1 SCMPs

SCM includes a set of individual functional entities and practices for enhancing the long-term competitive performance of individual firms and their supply chain as a whole by integrating the internal functions within the firm and effectively linking them with the external operations of suppliers, manufacturers, distributors, customers and other channel members (Kim, 2006). SCM encompasses all activities, which are involved in planning and management, sourcing and procurement, conversion and all logistics management activities as well as coordination and collaboration with channel partners (Soosay *et al.*, 2008).

There are many definitions of the SCM concept in the literature. According to Feldmann and Muller (2003), there is no generally accepted definition of SCM in the literature. SCM definitions are classified into three categories: integrated logistics management, purchasing and supply management, and integrated SCM. Some of these definitions are presented in Table I.

From the previous definitions, it is clear that the SCM concept reflects the reality of SCM as a strategic, managerial philosophy, and practice containing all SC partners – from suppliers, manufacturers, to customers – achieving better performance, gaining competitive advantage, and increasing customer satisfaction. For this research, SCM is defined as "a process of coordination of the business functions across the businesses within the firm and across businesses within other firms in supply chain for providing and improving products and information flows from suppliers till end customers in order to enhance firm performance and satisfy customer needs, wants, and requests", which is aligned with the integrated SCM stream.

SCMPs are implemented to achieve and enhance performance through supply chain, which require an internal cross-functional integration within the firm and external integration with suppliers and customers to be successful (Kannan and Tan, 2010; Kim, 2006). In developing countries, Jordan in particular, most of the entrepreneurs and managers generally ignore the concept of SCM, and even where it is applied, it is done partially lacking its true spirit and totality (Jraisat, 2010; Abu-Alrejal, 2007).

Traditional production/distribution processes have been radically changed across many countries and most firms are obliged to redesign their manufacturing network (Chan and Lam, 2011). Therefore, there are still many challenges facing firms, e.g. getting a product and/or service at the right time and place, in the right quantity, and at the lowest cost. Many firms began to realise that it is not enough to improve efficiencies just within the firm, but also in their whole supply chain. The growth and development of SCM is not driven only by internal motives, but also by a number of external factors such as increased globalisation, reduced barriers to international trade and improvements in information availability, and

Author(s)	Definition
Integrated logistics management	
Beamon (1999)	SCM is an integrated process wherein raw materials are manufactured into final products, then delivered to customers (via distribution, retail, or both)
Ellinger (2000)	SCM is the integration of all activities associated with the flow and transformation of goods from the raw material stage, through to the end user, as well as the associated information flows through improved inter-and intrafirm relationships to achieve sustainable competitive advantage
Turban *et al.* (2004)	SCM is the flow of materials, information, payments, and services from raw material suppliers, through factories and warehouses, to the end customers
Purchasing and supply management	
New and Payen (1995) and Scott and Westbrook (1991)	SCM is a chain linking each element of the manufacturing and supply process from raw materials through to the end user, encompassing several organisational boundaries
Christopher and Juttner (2000)	SCM is concerned to achieve a more cost-effective satisfaction of end-customer requirements through buyer-supplier integration
Integrated SCM	
Zhao *et al.* (2002) and Lee *et al.* (2007)	SCM is a process of integrating/utilising and co-ordinating products and information flows among suppliers, manufacturers, distributors, retailers and customers, so goods should be produced and delivered at the right quantities, at the right time, and at the lowest cost, whilst satisfying customer requirements
Chopra and Meindle (2004)	SCM is a set of approaches and practices to effectively integrate suppliers, manufactures, wholesalers, distributors, and customers for improving the long-term performance of the individual firms as well as supply chain as a whole in a cohesive and high-performing business model

Table I.
Definitions of SCM in the literature

environmental concerns. Therefore, some factors that provided stimulus for the development of existing trends in SCM include: computer generated production schedules, increasing importance of controlling inventory, government regulations and actions such as the creation of a single European market, establishing Qualified Industrial Zones, and the Guidelines of Global Agreement on Tariff and Trade and World Trade Organization (Gunasekaran *et al.*, 2004). Practicing SCM is considered an essential prerequisite to staying in the competitive global race and to growing profitability (Moberg *et al.*, 2002).

Various researchers have represented SCMPs from a multiplicity of perspectives, but all of them converge in the fact that their ultimate goal is to improve the performance of firms (Li *et al.*, 2005, 2006; Tan *et al.* 1998; Chen and Paulraj, 2004; Min and Mentzer, 2004). The SCMP construct used in this research amalgamates these research findings into the seven dimensions shown in Figure 1. A discussion of the seven dimensions that are considered a part of the SCMP construct is provided below.

2.1.1 Strategic supplier partnership (SSP). SSP is defined by Li *et al.* (2006) as "the long-term relationship between the organisation and its suppliers". It focusses on direct, long-term association and it is interested in mutual planning and problem-solving efforts (Arawati and Zafaran, 2008). Therefore, it is designed to enhance the operational and strategic efforts and capabilities of individual participating firms to achieve their goals (Li *et al.*, 2005). An effective supplier partnership is a critical component of leading edge supply chains (Arawati and Zafaran, 2008).

2.1.2 Level of information sharing (LIS). LIS is defined by Li *et al.* (2006) as "the extent to which critical and proprietary information is communicated to one's supply chain partner". Shared information can vary from strategic to tactical in nature and from information about logistics to customer and general market information (Min and Mentzer, 2004). Increasing attention on information integration prompts the increase of the establishment of strategic SC partners (Zhou and Benton, 2007). This construct has been previously tested and validated by various authors such as Li *et al.* (2005, 2006) and Wong *et al.* (2005). Knowledge management (KM) practices can support learning and growth of a manufacturing firm and its linkage to its supply chain. KM practices are based on information sharing of the supply chain tiers' shared experience and practices, and learning with respect to their mutual matters existed throughout their SC network. The performance indicators for MFP and supply chain performance (SCP) indicated in the paper can help measuring the level of development of the firm's knowledge, skill-set and behavioural aspects. This will facilitate producing a harmony within a company about how operations should be accomplished through internal integration, and it can be responsive to the supply chain requirements through its external integration to supply chain tiers.

2.1.3 Quality of information sharing. This dimension includes facets such as timeliness, accuracy, adequacy and credibility of information exchanged (Li *et al.*, 2006). According to Li and Lin (2006), ensuring the quality of shared information plays a key role in achieving effective SCM, and hence Li *et al.* (2006) suggest that organisations should ensure that it flows with minimum delay and distortion. Given the importance that quality of information sharing has been given in the academic literature in relation to its effect of SCM (Li *et al.*, 2006; Li and Lin, 2006), this has been included as one of the dimensions of the SCMP construct.

2.1.4 Customer relationship management (CRM). According to Lee *et al.* (2007), CRM is "concerned with planning, implementing, and evaluating successful relationships between providers and recipients either upstream or downstream of supply chain". CRM mainly refers to activities such as sharing product information with customers, interacting with them to manage demand and satisfy their wants and needs, accept customer orders, having an order placing system, sharing order status with customers during order scheduling, and the product delivery phase (Lee *et al.*, 2007). CRM has been widely studied in the academic literature as it is considered a core and key element of successful SCM (Lee *et al.*, 2007; Li *et al.*, 2005, 2006; Tan *et al.*, 1998).

2.1.5 Internal lean practice. Lean has gained popularity in a wide range of industrial sectors, beyond manufacturing, all around the world (Garza-Reyes *et al.*, 2012). It is nowadays considered the most influential new paradigm in manufacturing (Foerstl *et al.*, 2010), enhancing the competitiveness of organisations (Hines *et al.*, 2004). Lean is focussed on identifying and eliminating waste in a product's entire value stream, extending not only within the organisation, but also along its entire supply chain network (Boyle and Scherrer, 2009). Thus, the concept of lean supply chains has been widely studied in the academic literature (e.g. Chen *et al.*, 2013; Qrunfleh and Tarafdar, 2013). In most of the cases, these studies suggest that lean principles and practices enable the effective management of supply chains. This evidence contributed in considering this dimension as part of the SCMPs construct developed for this study.

2.1.6 Postponement. Postponement is defined by Li *et al.* (2006) as "the practice of moving forward one or more operations or activities (e.g. making, sourcing, and delivering) to a much later point in the supply chain". Its main objective is to push final product completion as close to the final customer as possible in order to reduce inventories and minimise risk of unsold product (Ferreira *et al.*, 2015). This factor has been widely studied, tested and validated in the SCM literature by, among other authors, Ferreira *et al.* (2015) and Li *et al.* (2005, 2006). This dimension has been included in the SC practices construct due to

the highly instable demand environment in Jordan. Postponement might therefore be a fundamental element of supply chain practice for Jordanian manufacturing firms.

2.1.7 Total quality management (TQM). TQM is a management philosophy which emphasises the necessity to meet the needs of internal and external customers as well as the importance of doing things correctly at the first time (Al-Khalifa and Aspinwall, 2000). Jabnoun (2002) argues that there is not an agreement, among authors, regarding what constitutes TQM. However, benchmarking, supplier relations, continuous improvement, customer satisfaction, empowerment and top management responsibility are the most cited elements of TQM in the academic literature (Garza-Reyes *et al.*, 2011). Although there is controversy regarding the results obtained from the implementation of TQM in relation to firm's performance (Mosadeghrad, 2014), the management of quality is one of the main constituents of SCMPs (Jraisat and Sawalha, 2013). This was the reason for including TQM as one of the dimensions of the SC practices construct.

2.2 SC performance

SCP has become a critical source of sustainable advantage in many industries (WH Ip *et al.*, 2011). SCP is defined by Banomyong and Supatn (2011) as "the efficiency which takes into account multiple performance measures related to supply chain members, as well as the integration and coordination of members' performance". According to Harland *et al.* (1999), most of the traditional performance measures are oriented towards economic performance.

Various studies have suggested and used a set of new measures to respond to the current requirements for SCP measurement. Stevens (1990) presents SCP measurement in terms of service level, cost, throughput efficiency, inventory level and supplier performance; on the other hand, SCP measures according to Pittigilio and Todd (1994) fall into one of the following four categories: customer satisfaction/quality, cost, time and assets. Spekman *et al.* (1998) used customer satisfaction and cost reduction as the SCP measure. Other qualitative SCP measures such as flexibility, information and material flow integration, customer satisfaction, supplier performance, and effective risk management were identified by Beamon (1999). As in practice it is not feasible to consider all the SCP dimensions found in the academic literature, those suggested by Beamon (1999) were adopted for this study as they are comprehensive and include all the dimensions of interest (see Figure 1). External-internal linkage between manufacturing firms and their supply chain facilitate reconfiguring their manufacturing systems exactly when needed to meet the requirements infused by market and/or suppliers and/or manufacturing requirements (Abdi and Labib, 2016). The external-internal linkage helps industries to update their information from the market that includes product demands and their life cycles in time, and from their suppliers that includes the parts and raw materials during the life cycles before ending demands. Table II presents the dimensions and their definitions.

2.2.1 Flexibility of supply chain. According to Koh *et al.* (2007), flexibility is defined as "the firm's ability to adapt to changes in its environment". Many researchers included "velocity" and "speed" into their flexibility definition and emphasised that flexibility means doing things fast (Li *et al.*, 2006). Therefore, adaptation of "many suppliers" practice gives the firm an opportunity to increase flexibility of generating alternative sourcing for procurement by reducing SC risks (Koh *et al.*, 2007). Thus, building long-term partnership relations with suppliers and customers helps to improve the flexibility of the SC by creating a mutual understanding among the members (Chang *et al.*, 2005). Chopra and Meindle (2004) indicated that there are four dimensions of flexibility: customer service, order, location and delivery time flexibility. In the literature, there are several types of flexibility: volume,

Dimension	Definitions	Literature
Flexibility of supply chain	Flexibility reflects a firm's ability to effectively adapt/respond to change that directly impacts a firm's customer	Xiao (2015) and Beamon (1999)
Integration of supply chain	The extent to which all activities within the firm, and its suppliers, customers, and supply chain members are integrated together	Alfalla-Luque *et al.* (2015), Huang *et al.* (2014) and Frohlich and Westbrook (2001)
Customer responsiveness	The firm's speed in response to customer orders	Reichhart and Holweg (2007) and Beamon (1999)
Supplier performance	Suppliers' ability to deliver raw materials/components/products to the firm on time and in good condition	Huang *et al.* (2014), Beamon (1999), Shin *et al.* (2000) and Tan *et al.* (1998)

Table II.
Definition of supply chain performance

dynamic operations, range and response flexibility (Ferry *et al.*, 2007). Flexibility ensures that changes caused by risky events can be absorbed by the SC through effective responses (Skipper and Hanna, 2009).

Therefore, some studies found that much of manufacturing flexibility enhancement effort was not successful and in some situations, flexibility could actually lead to negative results (Upton, 1994). Thus, firms do not benefit from the matching of internal manufacturing flexibility in uncertain environment, while it seems that more flexibility is not equivalent to higher competitiveness. In contrast, there is another group of researchers who confirmed the positive impact of flexibility on firm performance, for example, Swamidass and Newell (1987), found the positive effect of product mix and new product flexibility on net profit rate and sales growth. Additionally, firms which offered various product options were able to increase their market share (Bolwijn and Kumpe, 1990), while, in other studies it is found that there is a positive effect of volume flexibility on sales growth and net profits (Tannous, 1996).

2.2.2 Integration of supply chain. Integration is considered a core success factors for SCM because the implementation of SCM needs the integration of processes from sourcing, to manufacturing, and to distribution across SC (Stonebraker and Liao, 2006).

Various researchers have conceptualised SC integration in various ways, which refers to the extent to which separate parties are able to work together in a cooperative manner to arrive at mutually acceptable outcomes. Accordingly, this definition encompasses constructs pertaining to the degree of cooperation, coordination, integration and collaboration (Richey *et al.*, 2009). According to Frohlich and Westbrook (2001), there are two types of integration along the SC: the first type involves the forward coordination and integration of the physical flow of deliveries between suppliers, manufacturers and customers; the other type involves the backward coordination of information and flow of data from customers, manufacturers, to suppliers. Narasimhan and Jayaram (1998) state that internal integration involves the coordination, cooperation and collaboration between all internal functions within the firm from raw material management through production, shipping and sales; while, external integration emphasises on the coordination, collaboration and integration with other members outside the firm such as suppliers and customers (Giménez and Ventura, 2005). Magretta (1998) presents that higher level of SC integration will allow firms to meet customer wants and needs faster and more efficiently than non-integrated firms. Effective and superior SCM is directly related to highly integrated SC (Cook *et al.*, 2011). Therefore, SC strategies focus on how both internal and external business processes can be integrated and coordinated throughout the SC to better serve ultimate customers, while enhancing the performance of the individual SC members (Green *et al.*, 2008).

2.2.3 Customer responsiveness. Customer responsiveness is defined as the firm's speed in response to the customer orders and requests (Ramanathan *et al.*, 2011). Several research works pointed out that customer responsiveness is one of the most important factors that can be measured in the performance of SC. According to Owens and Richmond (1995), the main objectives of customer responsiveness are: increasing response to customer wants and needs, deriving costs out of the system and finally, turning savings into additional value for the customer. Effective performance measurement can be achieved based on SC metrics linked to customer satisfaction particularly (Banomyong and Supatn, 2011). Therefore, responsiveness is usually associated with innovative products or products with short lead time, which describes the level of collaboration needed (Ramanathan *et al.*, 2011).

2.2.4 Supplier performance. According to Beamon (1999), supplier performance is defined as suppliers' ability to deliver raw materials/components/products to the firm on time and in good condition. In practice, many firms emphasise on the importance to use a limited number of qualified suppliers due to the fact that a significant shift has occurred in the traditional adversarial buyer-seller relationship. Therefore, suppliers' involvement needs to identify buyers' expectations in terms of quality, quantity, delivery, service and price, and can help firms to improve them in overall quality, reduce costs and competition (Morrissey and Pittaway, 2006); when the expectations are met, this relationship becomes valuable and it turns into a useful tool that helps the company achieve its objectives (Fierro and Redondo, 2008).

2.3 Firms' performance

Firms' performance is a composite construct that indicates the business performance of a company. Specifically, it refers to how well a firm fulfils its financial and market goals (Li *et al.*, 2006). The short-term objectives of SCM are mainly to reduce inventory, increase productivity and reduce cycle time of products and services, while long-term objectives are to increase profits, penetrating new markets, increasing quality and increase market share for all units of the SC (Tan *et al.*, 1998). Fraser (2006) suggests that to achieve maximum business performance it is important to align or link operations, such as those of SCs, to financial metrics. In this line, Fraser (2006) comments that the better a company's system for measuring and tracking financial and operational performance, the more finances and operations improve. Thus, it is of paramount importance to investigate the effect that SCMPs have on the financial performance of manufacturing firms. This is done in this research through the MFP construct (see Figure 1). In line with previous studies, which have considered the financial as well as market performance of firms (Li *et al.*, 2006; Zhang, 2001), this dimension has also been included as part of the performance construct (see Figure 1). Financial measures for typical firms include current and future sales, operational cost, changeover cost from producing a product type to another, transportation cost of raw materials and finished products, and current and future profit. Although, financial performance measures, and particularly profits are the major reason for the manufacturing firm's existence and its linkage to the supply chain, non-financial measures are also important to determine the SCP and MFP.

Balanced scorecard can be used to evaluate firms' performance. Balanced scorecards can be used for MP and SCP with consideration of financial indicators derived from historical information of the company's financial stance, and non-financial indicators inheriting short-term, long-term, and operational targets to satisfy all stakeholders reflecting outcomes of the manufacturing firm in terms of success/failure. Using balanced scorecards external performance measures related the nature of the relationship between the manufacturing firm and suppliers and customers are taken into account.

3. Research methodology

The methodology adopted in this study followed the guidelines recommended in the reviewed literature (e.g. Li *et al.*, 2005, 2006; Tan *et al.*, 1998), which consisted of employing quantitative data collection procedures to facilitate the analysis and increase the validity and reliability of results. Thus, a questionnaire survey strategy was used in this study. The development of the instruments followed the four phases suggested by Li *et al.* (2006), namely: item generation, pre-pilot study, pilot study and large-scale data analysis. The instruments and their items are presented in Appendix 1.

3.1 Item generation, pre-pilot study and pilot study

Proper generation of measurement items of a construct determines the validity and reliability of an empirical research. Therefore, content validity is considered the main requirement for an effective measurement. In this case, content validity was initially achieved through a thorough literature review on SCMPs. This permitted the generation of the items.

Instrument's validity, according to Fraenkel and Wallen (2003), ensures the ability of an instrument to measure the intended concept. Consequently, to achieve a good level of instrument validity, a five-point Likert scale paper-based questionnaire survey was revised-in the pre-pilot study. The initial pool of generated items-by three specialist academics in operations management and four industrialist practitioner experts in SCM (i.e. logistics, purchasing, operations management and information systems) working in manufacturing firms. The objective of this revision was to ensure that each construct was properly and accurately addressed. The respondents were requested to provide feedback regarding the clarity of the questions as well as the organisation, logic and length of the questionnaire. This helped to refine the instrument. Based on their feedback, redundant and ambiguous items were modified, eliminated and new items were added wherever necessary.

Instrument's reliability refers to the "consistency of scores or answers from one administration of an instrument to another, and from one set of items to another" (Fraenkel and Wallen, 2003). Creswell (1994) states that the reliability score of an instrument indicates the stability and consistency of items contained and to what limit it measures the concept in a correct manner. The most popular test of reliability is Cronbach's α, which measures the internal consistency of an instrument. An α score of higher than 0.7 is accepted for all constructs of this study (Nunnally, 1978).

A small pilot study was performed using 14 responses ($n = 14$) out of 54 distributed to respondents similar to the target respondents. The survey was in English language with a cover letter introducing the research and briefly explaining its objectives, and including instructions for completion. It was responded by CEOs, presidents, vice-presidents, purchasing managers, supplying managers, operations managers and planning managers. The total number of items removed after the pilot study was 43 out of 96. Table III ((a)-(c)) summarises the results of the initial statistical analyses conducted during the pilot phase for all constructs. The responses were analysed using SPSS statistical software programme version 16. In this case, corrected-item total correlation (CITC) scores for each item with respect to a specific dimension of a construct were computed to purify the items. According to Cronbach (1951), the CITC score is a good indicator of how well each item contributes to the internal consistency of a particular construct as measured by the Cronbach's α coefficient. Thus, the next step was to determine the reliability coefficient (i.e. Cronbach's α) and each item's and sub-construct's CITC. Finally, item correlation matrices were used to identify and drop items that did not strongly contribute to Cronbach's α for the sub-construct. The optional feature in SPSS – "α if item deleted" statistic – was also used to determine if the item significantly contributed to α. This feature was particularly useful when an item appeared to fit more than one construct.

Item	Initial corrected item-total correlation	Final corrected item-total correlation	Initial α	Final α
(a) SCMPs construct				
Strategic supplier partnership (SSP)				
SCMP/SSP1: our firm relies on a few dependable suppliers	0.76	0.84		
SCMP/SSP2[a]: our firm considers quality factor one of main criterion in selecting our suppliers	0.21			
SCMP/SSP3[a]: our firm provides any help to improve the quality of suppliers' products	0.33			
SCMP/SSP4[a]: our firm has continuous improvement programmes that include our key suppliers	0.39			
SCMP/SSP5[a]: planning and goal-setting activities in our firm are included in our key suppliers	0.41			
SCMP/SSP6[a]: new product development processes in our firm is included in our key suppliers	0.17			
SCMP/SSP7[a]: our firm certifies our suppliers for quality	0.35			
SCMP/SSP8: our suppliers dealing with us in an open and honest way	0.83	0.86		
SCMP/SSP9: our suppliers have high reliability	0.78	0.81		
SCMP/SSP10: our firm relies on a few high quality suppliers	0.85	0.87		
SCMP/SSP11: our transactions with suppliers do not have to be closely monitored/supervised	0.74	0.79		
SCMP/SSP12[a]: there is a willingness from our suppliers to provide us with a lot of assistance without exceptions	0.45			
SCMP/SSP13[a]: we expect to leverage the business between us and our suppliers in the future	0.51			
SCMP/SSP14: our suppliers are highly committed to the agreements signed by us	0.83	0.85		
SCMP/SSP15[a]: there is a slimier understanding between us and our suppliers about aims and objectives	0.44			
SCMP/SSP17[a]: there is a slimier understanding between us and our suppliers about the importance	0.57	0.79		0.83
Level of information sharing (LIS)				
SCMP/LIS18: in case of any change needed, our partners will be informed in advance	0.87			
SCMP/LIS19: our firm sharing proprietary information with trading partners	0.80		0.84	
SCMP/LIS20[a]: if there are any issues that might affect our firm, our trading partners will keep us fully informed	0.44			
SCMP/LIS21[a]: our trading partners share firm knowledge to develop our core firm's processes	0.52			
SCMP/LIS22[a]: our firm exchange information with trading partners to establish our business planning	0.38	0.79	0.89	
SCMP/LIS23: our firm keeps in touch frequently with our trading partners and informs each other about any changes/events that may affect the other partners	0.76	0.84		0.87
Quality of information sharing (QIS)				
SCMP/QIS24[a]: information exchange between our firm and our partners is timely	0.22			
SCMP/QIS25: information exchange between our firm and our partners is accurate	0.79	0.83		
SCMP/QIS26: information exchange between our firm and our partners is complete	0.88	0.90	0.89	
SCMP/QIS27[a]: information exchange between our firm and our partners is adequate	0.39			
SCMP/QIS28: information exchange between our firm and our partners is reliable	0.76	0.80		0.91

(*continued*)

Table III.
Summary of SCMPs, SCP and MFP construct-initial statistics (pilot study)

Item	Initial corrected item-total correlation	Final corrected item-total correlation	Initial α	Final α
Customer service management (CSM)				
SCMP/CSM29: our firm frequently interacts with customers to be responsiveness, reliable, and other standards	0.81	84		
SCMP/CSM30: our firm frequently follow-up and monitor our customers for quality/service feedback	0.88	0.92		
SCMP/CSM31: our firm frequently measure and evaluate customer satisfaction	0.90	0.93		
SCMP/CSM32[a]: our firm frequently tries to determine future customer expectations	0.55			
SCMP/CSM33[a]: our firm provides and facilitates any assistance for our customers	0.48			
SCMP/CSM34: our firm periodically assess the importance of our relationship with customers	0.84	0.86	0.75	0.79
Internal lean practices (ILP)				
SCMP/ILP35: the firm policy looking for reducing set-up time	0.80	0.83		
SCMP/ILP36[a]: the firm adopts a "Pull" production system	0.27			
SCMP/ILP37: firm pushes and encourages suppliers for shorter lead-times	0.85	0.87		
SCMP/ILP38: firm streamlines ordering, receiving, and other works from suppliers	0.88	0.89		
SCMP/ILP39[a]: suppliers' warehouses/factories are located very close	0.47			
SCMP/ILP40[a]: time has been reduced for inspection of the incoming materials/components/products	0.50		0.80	0.84
Postponement (PO)				
SCMP/PO41[a]: our products are designed for modular assembly	0.45			
SCMP/PO42: production process in our firm can be re-arranged and some processes can be carried out later on at distribution centres	0.74	0.79		
SCMP/PO43: our firm is able to delay assembly activities for final product until customer orders has actually been received	0.92	0.94		
SCMP/PO44[a]: our firm is able to delay assembly activities for final product until the last possible position (or nearest to customers) in the supply chain	0.41	0.83		
SCMP/PO45: our goods are stored at appropriate distribution points close to the customers in the supply chain	0.79		0.82	0.86
Total quality management (TQM)				
SCMP/TQM46: top management in our firm is actively develops an integrated quality plan to meet business objectives	0.81	0.84		
SCMP/TQM47[a]: top management in our firm encourages employee to be involvement in quality management and improvement activities	0.53			
SCMP/TQM48[a]: top management in our firm offers all resources required for employee education and training	0.19			
SCMP/TQM49: our firm has an accurate and efficient database that provides information on internal operations, costs, and finances	0.86	0.87		

(*continued*)

Item	Initial corrected item-total correlation	Final corrected item-total correlation	Initial α	Final α
SCMP/TQM50[a]: production equipment's are maintained frequently according to maintenance plan	0.46			
SCMP/TQM51: our firm implements various inspections effectively and frequently	0.91	0.93		
SCMP/TQM52[a]: our firm uses quality control and statistical process control for process control and improvement	0.27			
SCMP/TQM53: our firm has quality circles and cross-functional teams	0.77	0.81		
SCMP/TQM54[a]: employees in our firm have an opportunity to be actively involved in quality-related activities	0.56			
SCMP/TQM55[a]: employees have a high responsibility and very committed to the success of our firm	0.29			
SCMP/TQM56: our firm has a salary promotion and incentives for encouraging employees' participation in quality improvement	0.83	0.87		
SCMP/TQM57[a]: excellent suggestions are appreciated from our firm and financially rewarded	0.35			
SCMP/TQM58[a]: employees' rewards and penalties are obvious and clear for all in our firm	0.44			
SCMP/TQM59[a]: employees in our firm are encouraged to accept new skills and training programmes	0.54			
SCMP/TQM60: our firm offers all resources required for employees training programmes	0.93	0.93		
SCMP/TQM61: most employees in our firm are trained on how to use different equipment's and tools	0.89	0.91		
SCMP/TQM62[a]: our firm collects extensive complaint information from customers	0.44			
SCMP/TQM63[a]: our firm has a programme to maintain good customer communication	0.52			
SCMP/TQM64[a]: our firm treats customer complaints based on quality criteria and with top priority	0.91	0.93		
SCMP/TQM65: our firm always conducts a customer satisfaction survey annually and collecting their suggestions for improving our products	0.78	0.79		
SCMP/TQM66[a] The reliability of the primary products in our firm is increasing	0.43			
SCMP/TQM67[a]: durability of the primary products in our firm is increasing	0.33			
SCMP/TQM68: the performance of the primary products in our firm is increasing	0.93	0.93		
SCMP/TQM69: the defect rates of the primary products in our firm are decreasing	0.86	0.90	0.87	0.89
(b) SCP construct				
Flexibility of supply chain (FSC)				
SCP/FSC1[a]: our supply chain is able to deal with different non-standard orders	0.31			
SCP/FSC2: our supply chain is able to offer special customer specifications	0.76	0.79		
SCP/FSC3: our supply chain is able to produce different features of products such as options, sizes, and colours	0.79	0.82		
SCP/FSC4[a]: our supply chain is able to adjust capacity (accelerate/decelerate) in production regarding to rapidly customer demand changes	0.37			
SCP/FSC5: our supply chain is able to introduce large numbers of product improvements	0.91	0.92		

(*continued*)

Item	Initial corrected item-total correlation	Final corrected item-total correlation	Initial α	Final α
SCP/FSC6[a]: our supply chain is able to offer/introduce new products for customers	0.54			
SCP/FSC7: our supply chain is able to respond to the needs and wants of the firm's target market	0.87	0.88	0.74	0.78
Integration of supply chain (ISC)				
SCP/ISC8: all functions in our organisation have high level of coordination and communication	0.80	0.82		
SCP/ISC9: cross-functional teams are usually used for process design/improvement firm	0.84	0.87		
SCP/ISC10: information systems encompass all functions in our firm, which provide high level of integration	0.91	0.92		
SCP/ISC11[a]: there are many cross-over activities between our firm and our trading partners	0.28			
SCP/ISC12[a]: there is a full system visibility in our supply chain from suppliers' suppliers to customers' customers	0.45		0.88	0.90
Customer responsiveness (CR)				
SCP/CR13: our firm fills customer orders on time without delay	0.77	0.79		
SCP/CR14[a]: our firm has short order-to-delivery time	0.39			
SCP/CR15: our firm is fast in customer response time	0.87	0.89	0.87	0.89
Supplier performance (SP)				
SCP/SP16: our suppliers provide us materials/components/products on time without delay	0.77	0.78		
SCP/SP17[a]: our suppliers provide dependable delivery to our firm	0.59			
SCP/SP18: our suppliers are highly reliable when provide us materials/components/products	0.81	0.85		
SCP/SP19: our suppliers provide our firm high quality of materials/components/products	0.88	0.90		
SCP/SP20: our suppliers provide our firm materials/components/products at lowest cost	0.91	0.93	0.92	0.93
(c) MFP construct				
Market share performance				
MFP/MSP1: market share	0.75	0.79		
MFP/MSP3: the growth of market share	0.79	0.81		
MFP/MSP4: the growth of sales	0.81	0.85	0.81	0.84
Financial performance				
MFP/FP2: return on investment	0.82	0.86		
MFP/FP5: growth in return on investment	0.79	0.83		
MFP/FP6: profit margin on sales	0.85	0.89		
MFP/FP7[a]: overall competitive position	0.37		0.79	0.79

Note: [a]Denote items were deleted

3.2 Large scale methods

This study targeted respondents with knowledge and experience on the operations and management of the supply chain of their firms. Thus, CEOs, presidents, vice-presidents, purchasing managers, supplying managers, operations managers and planning managers were sought as the main source of information. They were requested to refer to their major customers and suppliers when addressing relevant questions. This study included a total number of 498 firms from manufacturing sectors such as food processing, beverages, oil derivative products, furniture, apparel, textile, chemical, tobacco and cigarettes, paper and packaging, cement, potash, phosphates, fertilisers, rubber products, electrical equipment, plastics, etc. All these firms had been in business for at least five years and employed a minimum of 51 workers.

E-mail was considered the most effective method for the distribution of the questionnaires. Szwarc (2005) suggests that this distribution strategy has certain advantages that include quicker distribution, more professional appearance and lower cost. These advantages, according to Kirkham *et al.* (2014), contribute to increase the response rate. Cohen *et al.* (2007) acknowledge that a response rate of 30-35 per cent provides statistical significance, while Cook *et al.* (2000) state a response rate of between 27 and 56 per cent is acceptable. Of the questionnaires distributed 249 were returned, of which all were useable, giving an overall response rate of 50 per cent. Besides exceeding the percentage of response rate indicated by Cohen *et al.* (2007) and Cook *et al.* (2000) to achieve statistical significance, the number of firms surveyed was also higher than comparable studies, for example, those conducted by Li *et al.* (2005, 2006). The final survey data were analysed using a number of statistical techniques such as correlations, regressions and SEM. We used SEM analysis to cross-verify the findings of the correlations and regressions as well as to provide support for our proposed hypotheses.

4. Analysis of results

To test the significance of the constructs' relationships presented in Figure 1, three hypotheses (i.e. *H1*, *H2* and *H3*) were formulated.

4.1 Relationship between SCMPs and SCP

To test the relationship between SCMPs and SCP, *H1* is formulated as follows:

H1. There is a significant relationship between SCMPs and SCP dimensions.

H_0. There is no significant relationship between SCMPs and SCP dimensions.

Null (H_0) and alternative hypothesis (*H1*) regarding the non-statistical and statistical association between these two constructs were, respectively, created to form *H1*. Initially, the effects of the SCMP construct, and its seven dimensions, on every one of the four dimensions (i.e. SC flexibility, SC integration, customer responsiveness and supplier performance) of the SCP construct were analysed. However, to obtain an overall insight into the impact of all SCMPs together on the SCP of manufacturing firms, an overall analysis including all the dimensions of the SCMP and SCP constructs was conducted. Table IV presents the results of the (a) linear regression, (b) ANOVA and Pearson correlation computations for the overall analysis.

Table IV ((a) and (b)) indicates that all SCMPs have a statistical significant difference $p < 0.05$ and the proportion of variance explains 50.6 per cent ($R^2 = 0.506$); the F-value was 168.926. This means that there is a significant positive impact and hence indicates that there is a relationship between all SCMPs, when considered together, and SCP. Furthermore, the results shown by Table IV (c) suggest that the Pearson coefficient (r) for *H1* is 0.637, while the correlation has a probability (p) value of 0.000 for two-tailed test. A moderate, but still statistically significant positive correlation was found.

Table IV.
Results of the (a) coefficients of SSCMP and SCP ($n = 249$), (b) ANOVA and Pearson correlation analyses for the overall SCMPs and SCP relationship

(a)

Items	Un-standardized coefficients		Standardized coefficients	t	Sign. (p)	H_0 rejected (Yes/No)
	SE	B	β			
Constant	0.226	0.915		4.052	0.000	
Total SCMPs	0.061	0.790	0.637	12.997	0.000	Yes

(b)

	Sum of squares	df	Mean square	F	Sign. (p)	H_0 rejected (Yes/No)
Regression	19.799	1	19.799	168.926	0.000	Yes
Residual	28.950	247	0.117			
Total	48.749	248				

$R^2 = 0.506$

(c)

Coding	Total SCP items	Total SCMPs items
Total SCP items		
Pearson correlation	1	
Sig. (2-tailed)		
n	249	
Total SCMPs items		
Pearson correlation	0.637*	1
Sig. (2-tailed)	0.000	249
n	249	

Notes: Independent variables: SCMP/(SSP, LIS, QIS, CSM, ILP and TQM) dimensions; dependent variables: total SCP dimensions. *Correlation is significant at the 0.01 level

Thus, the H_0 for *H1* was rejected at $p < 0.05$ level, suggesting that there is a statically significant effect of the SCMPs adopted by Jordanian manufacturing firms on the performance of their supply chain. To further verify the findings of the correlations and regressions, a full-fledged SEM was constructed (see Figure 2). The best fit SEM model confirmed the findings of the previous analysis by showing a positive linkage between SCMPs and SCP. The fit indices of the SEM model shown in Table V indicate that all of them are within the acceptable ranges, thus validating the model. The path coefficient value between SCMP and SCP was found to be significant (0.59) at $p < 0.01$ level, hence showing the positive causal linkage between SCMP and SCP.

4.2 Relationship between SCMPs and firms' performance

To test the relationship between SCMPs and MFP; H2 is formulated as follows:

H2. There is a significant relationship between SCMPs and MFP dimensions.

H_0. There is no significant relationship between SCMPs and MFP dimensions.

H_0 and alternative hypothesis (*H2*) were also set to test the non-statistical and statistical significance of the relationship between the SCMP and MFP constructs. This resulted in the formulation of *H2* (*H2* as part of an initial study, the effects of the SCMP construct, and its seven dimensions were analysed in relation to the market share and financial performance dimensions of the MFP construct). However, to obtain an overall insight into the impact of all SCMPs together on the performance of manufacturing firms, an overall analysis including all the dimensions of the SCMP and MFP constructs was conducted. Table VI presents the results of the (a) linear regression, (b) ANOVA and Pearson correlation calculation for the overall analysis.

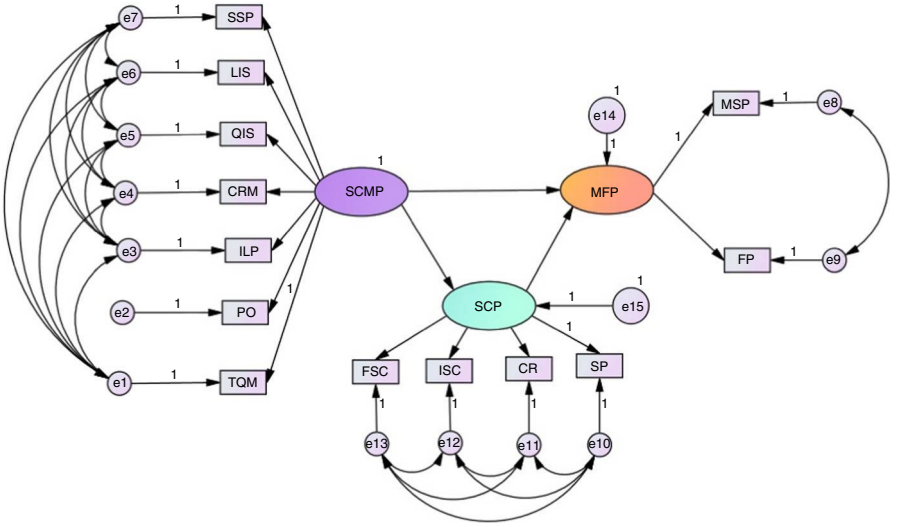

Figure 2.
Best fit SEM model

Fit indices	NFI (> 0.90)	RFI (> 0.90)	IFI (≈1.0)	TLI (≈1.0)	GFI (> 0.90)	CFI (≈1.0)	χ^2	df
Best fit model	0.965	0.937	0.982	0.966	0.947	0.981	89.9	43

Table V.
Fit indices for the best fit SEM model

Table VI ((a) and (b)) shows that all SCMPs have a statistical significant difference $p < 0.05$ in relation to all MFP dimensions together. This suggests that all SCMPs play an important role and have a significant positive and direct effect on the overall MFP. The proportion of variance explains 73.3 per cent ($R^2 = 0.733$); the F-value was 678.504. This means that there is a significant positive impact and hence indicates that there is a relationship between all SCMPs, when considered together, and all MFP dimensions. In addition, the results shown in Table VI (c) indicate that the Pearson coefficient (r) for this hypothesis is 0.856, while the correlation has a probability (p) value of 0.000 for one-tailed test. Thus, a strong positive and statistically significant correlation was found. For this reason, H_0 for *H2* was rejected at 0.05 level, suggesting that there is a statically significant effect of the SCMPs adopted by Jordanian manufacturing firms on their firms' performance. The outcome of the SEM analysis also supported the findings of the correlations and regressions as the path coefficient (0.26) was found to be significant at $p < 0.01$ level, thus showing that SCMPs have a positive influence on the MFP.

4.3 Relationship between SCP and firms' performance

In order to test *H3* to investigate the relations between SCP and MFP, it is formulated as follows:

H3. There is a significant relationship between SCP and MFP.

H_0. There is no significant relationship between SCP and MFP.

H_0 and alternative (*H3*) hypothesis related to a non-significant (H_0) and significant (*H1*) relationship between these two constructs were formulated. As part of an initial study, the effects of the SCP construct, and its four dimensions, was analysed in relation to the market

(a)

Items	Un-standardized coefficients		Standardized coefficients	*t*	Sign. (*p*)	H_0 rejected (Yes/No)
	SE	*B*	*β*			
Constant	0.124	0.561		4.525	0.000	
SCMPs (TAVR)	0.033	0.869	0.856	26.048	0.000	Yes

(b)

	Sum of squares	df	Mean square	*F*	Sign. (*p*)	H_0 rejected (Yes/No)
Regression	23.947	7	23.947	678.504	0.000	Yes
Residual	8.718	247	0.035			
Total	32.665	248				

$R^2 = 0.733$

(c)

Coding	Total SCMPs items	Total MFP items
Total SCMPs items		
Pearson correlation	1	
Sig. (2-tailed)		
n	249	
Total MFP items		
Pearson correlation	0.856*	1
Sig. (2-tailed)	0.000	
n	249	249

Table VI. Results of the (a) coefficients of SCMPs and MFP ($n = 249$), (b) ANOVA and Pearson correlation analyses for the overall SCMPs and MFP relationship

Notes: Independent variables: SCMP/(SSP, LIS, QIS, CSM, ILP, PO and TQM) dimensions; dependent variables: Total MFP dimensions. *Correlation is significant at the 0.01 level

share and financial performance dimensions of the MFP construct. However, to obtain an insight into the overall impact of the SCP of Jordanian manufacturing firms on their firms' performance, an overall analysis including all the dimensions of the SCP and MFP constructs was conducted. Table VI presents the results of the (a) linear regression, (b) ANOVA and Pearson correlation calculation for the overall analysis.

The results shown in Table V ((a) and (b)) suggest that the total SCP dimensions have statistical significant differences $p < 0.05$ in relation to all MFP dimensions together. This means that all dimensions of the SCP play an important role and have a significant and direct positive impact on the overall performance of manufacturing firms. The proportion of variance explains 73.3 per cent ($R^2 = 0.733$); the *F*-value was 666.158. This means that there is a significant positive impact and an existent relationship between all SCP dimensions together and total MFP dimensions. Moreover, the results shown in Table VII (c) indicate that the Pearson coefficient (*r*) for *H3* is 0.854, while the correlation has a probability (*p*) value of 0.000 for two-tailed test. Hence, a strong positive and statistically significant correlation was found. Therefore, the H_0 for *H3* was rejected at 0.05 level. A positive path coefficient (0.62) in the SEM model further verified the findings of the correlation and regression analysis.

4.4 Summary of results

The three hypotheses formulated and tested in the previous sections represent three causal relationships in the theoretical research framework (see Figure 1) studied in this work. The analyses and findings are summarised in Table VIII. In general, they indicate that there are significant and direct relationships between SCMPs and SCP; SCMPs and MFP; and SCP and MFP. These findings were also verified using the SEM analysis as path co-efficients

(a)

Items	Un-standardized coefficients		Standardized coefficients	*t*	Sign. (*p*)	H_0 rejected (Yes/No)
	SE	*B*	*β*			
Constant	0.105	1.091		10.433	0.000	
SCP items (TAVR)	0.027	0.699	0.854	25.810	0.000	Yes

(b)

	Sum of squares	df	Mean square	*F*	Sign. (*p*)	H_0 rejected (Yes/No)
Regression	23.829	1	23.829	666.158	0.000	Yes
Residual	8.836	247	0.036			
Total	32.665	248				

$R^2 = 0.733$

(c)

Coding	Total MFP items	Total SCP items
Total MFP items		
Pearson correlation	1	
Sig. (2-tailed)		
n	249	
Total SCP items		
Pearson correlation	0.854*	1
Sig. (2-tailed)	0.000	
n	249	249

Notes: Independent variables: SCP/(FSC, ISC, CR and SP) dimensions; dependent variables: total MFP dimensions. *Correlation is significant at the 0.01 level

Table VII. Results of the (a) coefficients of SCP and MFP ($n = 249$), (b) ANOVA and Pearson correlation analyses for the overall SCP and MFP relationship

Hypothesis	Relationship (total average)	Total effect (*p*-value)	Pearson correlation coefficient (*r*)	R^2	Direct/indirect effect	H_0 rejected (Yes/No)
H1	SCMPs→SCP	0.000*	0.637	0.506	Direct	Yes
H2	SCMPs→MFP	0.000*	0.856	0.733	Direct	Yes
H3	SCP→MFP	0.000*	0.854	0.733	Direct	Yes

Note: *Value is significant at $\alpha < 0.05$

Table VIII. Summary of causal relationships for the theoretical research framework and the formulated hypotheses

were found to be positive, thus showing the positive causality between the SCMP, SCP and MFP. We also tested the role of MFP as a mediating variable however our analysis shows that the mediation effect of MFP was not stronger than the direct effect of SCMP on SCP.

Table IX presents a summary of the correlation matrix for the three proposed hypotheses. This table indicates that SCMPs directly affect SCP (*H1*). Thus, SCMPs are considered vital and have an impact on improving the SCP of manufacturing firms. Therefore, these practices play a vital role to facilitate the flow of products and raw materials and for enhancing the SCP efficiency of these firms ($R^2 = 0.406$). The results in Table IX also show that the Pearson coefficient (*r*) for *H1* is 0.637; the correlation has a probability (*p*) value of 0.000 for two-tailed test. Hence, a moderate positive and statistically significant correlation was found. Therefore, H_0 was rejected for *H1* (see Table VIII) at the 0.05 level.

The direct relationship between SCMPs and MFP indicates that SCMPs directly affect MFP. This suggests that, within the context of manufacturing firms, the adoption and successful implementation of SCMPs will directly improve their financial and market share

Coding	Total SCMPs items	Total SCP items	Total MFP items
Total SCMPs items			
Pearson correlation	1		
Sig. (2-tailed)			
Total SCP			
Pearson correlation	0.637(**)	1	
Sig. (2-tailed)	0.000		
Total MFP			
Pearson correlation	0.856(**)	0.854(**)	1
Sig. (2-tailed)	0.000	0.000	

Table IX. Correlations matrix for proposed hypotheses

Notes: $n = 249$. Correlation is significant at the 0.1 level (two-tailed). **Correlation is not significant at the 0.05 level (two-tailed)

performances in the long-run. This effect is in line with comparable previous studies found in the literature (Shin *et al.*, 2000; Tan *et al.*, 1998), which had not taken into consideration any intermediate variable(s) such as competitive advantage or SCP. The results show that there exists an immediate impact of SCP on MFP. MFP is also indirectly influenced by SCP. The results shown in Table IX indicate that the Pearson coefficient (r) for *H2* is 0.856; the correlation has a probability (p) value of 0.000 for two-tailed test. Hence, a strong positive and statistically significant correlation was found. Therefore, H_0 was rejected for *H2* (see Table VIII) at the 0.05 level.

Finally, the direct relationship between SCP and MFP indicates that SCP directly affects MFP. This suggests that well-managed and well-executed SCP in terms of flexibility and integration of the SC, responding quickly to customers, and having a few highly dependable suppliers will directly have a positive effect on MFP. The results shown in Table VIII indicate that the Pearson coefficient (r) for *H3* is 0.854; the correlation has a probability (p) value of 0.000 for two-tailed test. Hence, a strong positive and statistically significant correlation was found. Therefore, H_0 was rejected for *H3* (see Table VII) at the 0.05 level.

5. Research implications and limitations

5.1 Research implications

This research has several important practical and theoretical implications. First, the traditional paradigm of competition between firms has shifted to a competition between supply chains (Andersen and Skjoett-Larsen, 2009; Li *et al.*, 2006). For this reason, more and more firms are increasingly adopting SCMPs to achieve cost-reductions, improving their efficiencies and quality, and ultimately enhancing their competitiveness. However, there are still doubts regarding the potential benefits of SCM over existing practices and under certain environmental conditions (Trkman and McCormack, 2009; Meehan and Muir, 2008). Thus, the findings of this study confirm that effective SCM is a potentially valuable approach in improving supply chain and firm's performance through the adoption of some specific SCMPs, e.g. those presented in the SCMP construct shown in Figure 1. The findings of this research, thus, demonstrate and highlight the importance of SCMPs to firms.

Second, since SCM has been poorly defined and hence there is a high degree of variability in its meaning and understanding (Li *et al.*, 2006; Cigolini *et al.*, 2004), various researchers have identified several practices of SCM that firms can adopt. For instance, many firms still consider SCM as simply being related to purchasing and supplier management (Banfield, 1999), or as a synonym of transportation and logistics management that focusses on inventory reduction (Rudberg and Olhager, 2003). In this line, although most firms recognise and emphasise the importance of adopting SCMPs, many of them still do not know

exactly what and which practices they should implement. The findings of this study demonstrate that firms should not only focus on traditional SCM activities such as purchasing and supplier management or transportation and logistics management, but also consider the importance of more contemporary SCMPs, including building SSP, leveraging the LIS with trading partners, and implementing an effective internal lean system. Therefore, the results of this study should encourage these firms in developing the effectiveness of these practices. In this context, this study has provided SC managers of manufacturing firms, particularly those in developing economies, with a useful multi-dimensional operational measure of the construct of SCMP for assessing the comprehensiveness of the current SCMPs of their firms.

The research findings are generic and can be adapted to the supply chains of any manufacturing industry, e.g. automotive industries and eclectic/electronic production with variable demands in a developing country with similar logistic infrastructure to that of Jordan. The findings can assist manufacturing managers and researchers to better understand elements influencing SCP in developing countries with similar characteristics. Similar developing countries can include Middle Eastern countries, that are emerging economies experiencing manufacturing growth, developing essential transportation infrastructure, fundamental IT and communication infrastructure, e.g. internet, suitable legislation for information sharing across the supply chain tiers, and potential capability for integration of supply chain. The proposed model can be adapted to the supply chain network along with adjustment of the research findings for informed decision and policy making.

Production type of the beneficial industry is not limited to specific products or processes that may include manufacturing/assembly industries with multi-stage manufacturing supply chain. However, the reconfiguration parameters may vary from a system to another and must be redefined accordingly.

5.2 Research limitations

Despite the practical and theoretical contributions of this research, it presents various constraints. First, this study only relies on a quantitative research methodology based on the collection and analysis of hard numerical evidence. In future studies, there is a need to follow this type of methodology for all constructs and then gather qualitative data to explore their relationships to not only validate the results from this research, but also expand its context by obtaining more in-depth insights on firms' attitudes, thoughts, and actions, specially related to their SCMPs and the relationships with the constructs studied.

Second, in this research, a limited number of SCMPs were considered. These SCMPs were selected, based on the literature review and the input from practicing managers as those that would be the most important for the specific case of manufacturing firms. Therefore, some other SCMPs and constructs, such as infrastructure and competitive advantage, can also be considered for future research. This is part of the future research agenda derived and proposed from this study. Finally, we are proposing that Jordan is a typical case of a developing economy but there is a broad range of development stages for countries and further research in more countries on the spectrum of development would provide more insight into the practicalities of developing the antecedents of SCP presented in this paper.

6. Conclusion

This study represents a significant large-scale empirical effort to explore the causal relationships of SCMPs with SCP and MFP within the context of the Jordanian manufacturing sector. Different definitions of SCM exist in the academic literature (Cigolini *et al.*, 2004; Li *et al.*, 2006), while most of the empirical research has mainly focussed on either the upstream or the downstream side of SCs. In this context, few studies have empirically considered both sides of SCs simultaneously (Li *et al.*, 2006). The theoretical framework proposed to conduct this study considers both sides of SCs. This study, thus, aims at contributing by stimulating

scholars to further study this area in depth, which will lead to a better understanding the SCM theory. Based on this, firms can develop a deeper and richer knowledge on their SCs to help them formulate more effective strategies for their effective management.

To investigate and test the theoretical framework, data were collected through a questionnaire survey responded by 249 Jordanian manufacturing firms, and the framework tested by using linear regression, ANOVA and Pearson correlation. The results obtained from these analyses were further validated using SEM. This study contributes to the body of knowledge in the SCM field in a number of ways. First, this study provides a theoretical framework that explores and identifies multiple constructs, and dimensions, of SCM, including SCMPs, SC performance, and firms' performance. In future research this framework can be extended by adding more constructs and/or dimensions. The constructs could include relevant aspects that may influence supply chains and their performance, for example, a country's infrastructure and firms' competitiveness.

Second, this study provides strong support of evidence to the literature regarding the impact of SCMPs on various performance dimensions. The results indicate that a higher level of adoption, implementation and improvement in SCMPs will directly lead to improve SC and overall firms' performance. In addition, a higher level of SCMPs will also lead to a higher level of SC performance. Most industrial firms' theories, for example, competitive strategy, cost analysis and political economy all highlight the importance and emphasise the implementation of SCM (Li *et al.*, 2006). Therefore, the results of this study provide the empirical support to these theories. Third, the results of this study indicate and highlight the best and specific SCMPs that can be adopted by Jordanian manufacturing firms to improve their SC and overall firms' performance.

The research findings also emphasise that the proposed conceptual framework used for the Jordanian manufacturing supply chain can be well applied to other developing countries with similar capabilities and circumstances. The proposed model and the research findings have the potential to help policy makers to design better policies for supply chain and performance measurement.

References

Abdi, M.R. and Labib, A. (2016), "RMS capacity utilisation: product family and supply chain", *International Journal of Production Research*, Vol. 50 No. 17, pp. 4908-4921.

Abu-Alrejal, H. (2007), "The impact of supply-chain management capabilities on business performance of industrial organizations in Republic of Yemen: field study", thesis, Yarmouk University.

Abylaev, M., Pal, R. and Torstensson, H. (2014), "Resilience challenges for textile enterprises in a transitional economy and regional trade perspective – a study of Kyrgyz conditions", *International Journal of Supply Chain and Operations Resilience*, Vol. 1 No. 1, pp. 54-75.

Alfalla-Luque, R., Marin-Garcia, J.A. and Medina-Lopez, C. (2015), "An analysis of the direct and mediated effects of employee commitment and supply chain integration on organisational performance", *International Journal of Production Economics*, Vol. 162 No. 1, pp. 242-257.

Al-Khalifa, K.N. and Aspinwall, E.M. (2000), "The development of total quality management in Qatar", *The TQM Magazine*, Vol. 12 No. 3, pp. 194-204.

Andersen, M. and Skjoett-Larsen, T. (2009), "Corporate social responsibility in global supply chains", *Supply Chain Management: An International Journal*, Vol. 14 No. 2, pp. 75-86.

Arawati, A. and Zafaran, H. (2008), "The strategic supplier partnership in a supply chain management with quality and business performance", *International Journal of Business and Management Science*, Vol. 1 No. 2, pp. 129-145.

Banfield, E. (1999), *Harnessing Value in the Supply Chain*, Wiley, New York, NY.

Banomyong, R. and Supatn, N. (2011), "Developing a supply chain performance tool for SMEs in Thailand", *Supply Chain Management: An International Journal*, Vol. 16 No. 1, pp. 20-31.

Beamon, B. (1999), "Measuring supply chain performance", *International Journal of Operations & Production Management*, Vol. 19 No. 3, pp. 7-12.

Blos, M.F., Quaddus, M., Wee, H.W. and Watanabe, K. (2009), "Supply chain risk management (SCRM): a case study on the automotive and electronic industries in Brazil", *Supply Chain Management: An International Journal*, Vol. 14 No. 4, pp. 247-252.

Bolwijn, P. and Kumpe, T. (1990), "Manufacturing in the 1999's: productivity, flexibility and innovation", *Long Range Planning*, Vol. 23 No. 4, pp. 44-57.

Boyle, T.A. and Scherrer, R.M. (2009), "An empirical examination of the best practices to ensure manufacturing flexibility", *Journal of Manufacturing Technology Management*, Vol. 20 No. 3, pp. 348-366.

Carvalho, H., Azevedo, S.G. and Cruz-Machado, V. (2014), "Supply chain management resilience: a theory building approach", *International Journal of Supply Chain and Operations Resilience*, Vol. 1 No. 1, pp. 3-27.

Chan, W. and Lam, C. (2011), "Modeling supply chain performance and stability", *Industrial Management and Data Systems*, Vol. 111 No. 8, pp. 1323-1354.

Chang, S., Chen, R., Lin, R., Tien, S. and Sheu, C. (2005), "Supplier involvement and manufacturing flexibility", *Technovation*, Vol. 26 No. 10, pp. 1136-1146.

Chen, I. and Paulraj, A. (2004), "Towards a theory of supply chain management: the constructs and measurements", *Journal of Operations Management*, Vol. 22 No. 2, pp. 119-150.

Chen, J.C., Cheng, C.H. and Huang, P.B. (2013), "Supply chain management with lean production and RFID application: a case study", *Expert Systems with Applications*, Vol. 40 No. 9, pp. 3389-3397.

Choi, S.B., Min, H., Joo, H.Y. and Choi, H.B. (2016), "Assessing the impact of green supply chain practices on firm performance in the Korean manufacturing industry", *International Journal of Logistics Research and Applications: A Leading Journal of Supply Chain Management*, Vol. 20 No. 2, pp. 129-145, doi: 10.1080/13675567.2016.1160041.

Chopra, S. and Meindle, P. (2004), *Supply Chain Management: Strategy, Planning, and Operation*, Prentice-Hall, Upper Saddle River, NJ.

Chow, W.S., Madu, C.N., Kuei, C.H., Lu, M.H., Lin, C. and Tseng, H. (2008), "Supply chain management in the US and Taiwan: an empirical study", *Omega*, Vol. 36 No. 5, pp. 665-679.

Christopher, M. and Juttner, U. (2000), "Developing strategic partnership in the supply chain: a practitioner perspective", *European Journal of Purchasing and Supply Management*, Vol. 6 No. 2, pp. 117-127.

Cigolini, R., Cozzi, M. and Perona, M. (2004), "A new framework for supply chain management: conceptual model and empirical test", *International Journal of Operations & Production Management*, Vol. 24 No. 1, pp. 7-14.

Cohen, L., Manion, L. and Morrison, K. (2007), *Research Methods in Education*, 6th ed., Routledge, Oxford.

Cook, C., Heath, F. and Thompson, R.L. (2000), "A meta-analysis of response rates in web- or internet-based surveys", *Educational and Psychological Measurement*, Vol. 60 No. 6, pp. 821-836.

Cook, L., Heiser, S.D. and Sengupta, K. (2011), "The moderating effect of supply chain role on the relationship between supply chain practices and performance", *International Journal of Physical Distribution and Logistics Management*, Vol. 41 No. 2, pp. 104-134.

Creswell, J. (1994), *Research Design: Qualitative and Quantitative Approach*, Sage Publication, London.

Cronbach, L.J. (1951), "Coefficient alpha and internal structure tests", *Psychometrika*, Vol. 16 No. 3, pp. 297-334.

Dani, S. and Deep, A. (2010), "Fragile food supply chains: reacting to risks", *International Journal of Logistics Research and Applications: A Leading Journal of Supply Chain Management*, Vol. 13 No. 5, pp. 395-410.

Diniz, J.D.A.S. and Fabbe-Costes, N. (2007), "Chain management and supply chain orientation: key factors for sustainable development projects in developing countries?", *International Journal of Logistics Research and Applications: A Leading Journal of Supply Chain Management*, Vol. 10 No. 3, pp. 235-250.

Ellinger, A. (2000), "Improving marketing/logistics cross-functional collaboration in the supply chain", *Industrial Marketing Management*, Vol. 29, pp. 85-96.

Feldmann, M. and Muller, S. (2003), "An incentive scheme for true information providing in supply chains", *Omega*, Vol. 31 No. 2, pp. 63-73.

Ferreira, K.A., Nogheira Tomas, R. and Alcantara, R.L.C. (2015), "A theoretical framework for postponement concept in a supply chain", *International Journal of Logistics Research and Applications: A Leading Journal of Supply Chain Management*, Vol. 18 No. 1, pp. 46-61.

Ferry, J., Kevin, P. and Rodney, C. (2007), "Supply chain practice, supply chain performance indicators and competitive advantage of australian beef enterprises: a conceptual framework", paper presented at Annual Conference of Australian Agricultural and Recourse Economics Society Queenstown, 13-16 February.

Fierro, J. and Redondo, Y. (2008), "Creating satisfaction in the demand-supply chain: the buyers' perspective", *Supply Chain Management: An International Journal*, Vol. 13 No. 2, pp. 160-169.

Finne, M. and Holmström, J. (2013), "A manufacturer moving upstream: triadic collaboration for service delivery", *Supply Chain Management: An International Journal*, Vol. 18 No. 1, pp. 21-33.

Foerstl, K., Reuter, C., Hartmann, E. and Blome, C. (2010), "Managing supplier sustainability risks in a dynamically changing environment – sustainable supplier management in the chemical industry", *Journal of Purchasing and Supply Management*, Vol. 16 No. 2, pp. 118-130.

Fraenkel, J.R. and Wallen, N.E. (2003), *How to Design and Evaluate Research in Education*, 5th ed., McGraw-Hill, New York, NY.

Fraser, J. (2006), "Metrics that matter: uncovering KPIs that justify operational improvements", Research Project Carried out by Manufacturing Enterprise Solutions Association (MESA) and Presented at Plant2Enterprise Conference, Orlando, FL, 24-25 February.

Frohlich, M.T. 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.

Garza-Reyes, J.A., Al-Jasser, A., Oraifige, I., Soriano-Meier, H. and Forrester, P.L. (2011), "A general evaluation of total quality management (TQM) in the Kuwait oil industry", *Proceedings of the 21st International Conference on Flexible Automation and Intelligent Manufacturing (FAIM), Taichung, 26-29 June*.

Garza-Reyes, J.A., Parkar, H.S., Oraifige, I., Soriano-Meier, H. and Harmanto, D. (2012), "An empirical-exploratory study of the status of lean manufacturing in India", *International Journal of Business Excellence*, Vol. 5 No. 4, pp. 395-412.

Giménez, C. and Ventura, E. (2005), "Logistics-production, logistics-marketing and external integration: their impact on performance", *International Journal of Operations & Production Management*, Vol. 25 No. 1, pp. 20-38.

Green, K.W. Jr, Whitten, D. and Inman, R.A. (2008), "The impact of logistics performance on organizational performance in a supply chain context", *Supply Chain Management: An International Journal*, Vol. 13 No. 4, pp. 317-327.

Gunasekaran, A., Patel, C. and McGaughey, R. (2004), "A framework for supply chain performance measurement", *International Journal Production Economics*, Vol. 87 No. 1, pp. 333-347.

Harland, C., Lamming, R. and Cousins, P. (1999), "Developing the concept of supply strategy", *International Journal of Operations & Production Management*, Vol. 19 No. 7, pp. 650-673.

Hines, P., Holweg, M. and Rich, N. (2004), "Learning to evolve: a review of contemporary lean thinking", *International Journal of Operations & Production Management*, Vol. 24 No. 10, pp. 994-1011.

Huang, M.C., Yen, G.F. and Liu, T.C. (2014), "Reexamining supply chain integration and the supplier's performance relationships under uncertainty", *Supply Chain Management: An International Journal*, Vol. 19 No. 1, pp. 64-78.

Igarashi, M., de Boer, L. and Fet, A.M. (2013), "What is required for greener supplier selection? A literature review and conceptual model development", *Journal of Purchasing and Supply Management*, Vol. 19 No. 4, pp. 247-263.

Inemek, A. and Tuna, O. (2009), "Global supplier selection strategies and implications for supplier performance: Turkish suppliers' perception", *International Journal of Logistics Research and Applications: A Leading Journal of Supply Chain Management*, Vol. 12 No. 5, pp. 381-406.

Ip, W.H., Chan, S. and Lam, C. (2011), "Modeling supply chain performance and stability", *Industrial Management and Data Systems*, Vol. 111 No. 8, pp. 1332-1354.

Jabnoun, N. (2002), "Control process for total quality management and quality assurance", *Work Study*, Vol. 51 No. 4, pp. 182-190.

Johnsen, T.E. (2011), "Supply network delegation and intervention strategies during supplier involvement in new product development", *International Journal of Operations & Production Management*, Vol. 31 No. 6, pp. 686-708.

Jraisat, L. (2010), "Information sharing in an export supply chain relationship: the case of the Jordanian fresh fruit and vegetable export industry", PhD thesis, Brunel University, Brunel.

Jraisat, L.E. and Sawalha, I.H. (2013), "Quality control and supply chain management: a contextual perspective and a case study", *Supply Chain Management: An International Journal*, Vol. 18 No. 2, pp. 194-207.

Kannan, V.R. and Tan, K.C. (2004), "Supplier alliances: differences in attitudes to supplier and quality management of adopters and non-adopters", *Supply Chain Management: An International Journal*, Vol. 9 No. 4, pp. 279-286.

Kannan, V.R. and Tan, K.C. (2010), "Supply chain integration: cluster analysis of the impact of span of integration", *Supply Chain Management: An International Journal*, Vol. 15 No. 3, pp. 207-215.

Kim, S. (2006), "Effects of supply chain management practices, integration and competition on performance", *Supply Chain Management: An International Journal*, Vol. 11 No. 3, pp. 241-248.

Kirkham, L., Garza-Reyes, J.A., Kumar, V. and Antony, J. (2014), "Prioritisation of operations improvement projects in the European manufacturing industry", *International Journal of Production Research*, Vol. 52 No. 18, pp. 5323-5345.

Koh, S., Demirbag, M., Bayraktar, E., Tatoglu, E. and Zaim, S. (2007), "The impact of supply chain management practices on performance of SMEs", *Industrial Management & Data systems*, Vol. 107 No. 1, pp. 103-124.

Kumar, V., Holt, D., Ghobadian, A. and Garza-Reyes, J.A. (2015), "Developing green supply chain management taxonomy based decision support systems", *International Journal of Production Research*, Vol. 53 No. 21, pp. 6372-6389.

Lee, C., Kwon, I. and Severance, D. (2007), "Relationship between supply chain performance and degree of linkage among supplier, internal integration, and customer", *Supply Chain Management: An International Journal*, Vol. 12 No. 6, pp. 444-452.

Lee, P.K.C., Yeung, A.C.L. and Cheng, T.C.E. (2009), "Supplier alliances and environmental uncertainty: an empirical study", *International Journal of Production Economics*, Vol. 120 No. 1, pp. 190-204.

Li, S. and Lin, B. (2006), "Accessing information sharing and information quality in supply chain management", *Decision Support Systems*, Vol. 42 No. 3, pp. 1641-1656.

Li, S., Ragu-Nathan, B., Ragu-Nathan, T.S. and Rao, S.S. (2006), "The impact of supply chain management practices on competitive advantage and organizational performance", *Omega*, Vol. 34 No. 2, pp. 107-124.

Li, S., Rao, S.S., Ragu-Nathan, T.S. and Ragu-Nathan, B. (2005), "Development and validation of a measurement instrument for studying supply chain management practices", *Journal of Operations Management*, Vol. 23 No. 6, pp. 618-641.

Li, T. and Zhang, H. (2015), "Information sharing in a supply chain with a make-to-stock manufacturer", *Omega*, Vol. 50 No. 2, pp. 115-125.

Magretta, J. (1998), "The power of virtual integration: an interview with Dell Computer's Michael Dell", *Harvard Business Review*, Vol. 76 No. 2, pp. 73-84.

Meehan, J. and Muir, L. (2008), "SCM in Merseyside SMEs: benefits and barriers", *The TQM Journal*, Vol. 20 No. 3, pp. 223-232.

Min, S. and Mentzer, J.T. (2004), "Developing and measuring supply chain concepts", *Journal of Business Logistics*, Vol. 25 No. 1, pp. 63-99.

Moberg, C., Cutler, B., Gross, A. and Speh, T. (2002), "Identifying antecedents of information exchange within supply chains", *International Journal of Physical Distribution & Logistics Management*, Vol. 32 No. 9, pp. 755-770.

Morrissey, J. and Pittaway, L. (2006), "Buyer-supplier relationships in small firms; the use of social factors to manage relationships", *International Small Business Journal*, Vol. 24 No. 3, pp. 272-298.

Mosadeghrad, A.M. (2014), "Why TQM programmes fail? A pathology approach", *The TQM Journal*, Vol. 26 No. 2, pp. 160-187.

Narasimhan, R. and Jayaram, J. (1998), "Causal linkage in supply chain management: an exploratory study of North America manufacturing firms", *Decision Science*, Vol. 29 No. 3, pp. 579-605.

Narasimhan, R., Kim, S. and Tan, K. (2008), "An empirical investigation of supply chain strategy typologies and relationships to performance", *International Journal of Production Research*, Vol. 46 No. 18, pp. 5231-5259.

New, S. and Payen, P. (1995), "Research frameworks in logistics: three models, seven dinners and a survey", *International Journal of Physical Distribution and Logistics*, Vol. 25 No. 10, pp. 60-77.

Nunnally, J. (1978), *Psychometric Theory*, McGraw-Hill, New York, NY.

Oosterhuis, M., van der Vaart, T. and Molleman, E. (2012), "The value of upstream recognition of goals in supply chains", *Supply Chain Management: An International Journal*, Vol. 17 No. 6, pp. 582-595.

Owens, G. and Richmond, B. (1995), "Best practices in retailing: how to reinvent your supply chain: what works, what doesn't", *Chain Store Age*, Vol. 71 No. 11, pp. 96-98.

Papakiriakopoulos, D. and Pramatari, K. (2010), "Collaborative performance measurement in supply chain", *Industrial Management and Data Systems*, Vol. 110 No. 9, pp. 1297-1318.

Papalexi, M., Bamford, D. and Dehe, B. (2016), "A case study of kanban implementation within the pharmaceutical supply chain", *International Journal of Logistics Research and Applications: A Leading Journal of Supply Chain Management*, Vol. 19 No. 4, pp. 239-255.

Pittigilio, R. and Todd, M. (1994), *Integrated Supply Chain Performance Measurement: A Multi-Industry Consortium Recommendation*, PRTM, Weston, MA.

Qrunfleh, S. and Tarafdar, M. (2013), "Lean and agile supply chain strategies and supply chain responsiveness: the role of strategic supplier partnership and postponement", *Supply Chain Management: An International Journal*, Vol. 18 No. 6, pp. 571-582.

Ramanathan, U., Gunasekaran, A. and Subramanian, N. (2011), "Supply chain collaboration performance metrics: a conceptual framework", *Benchmarking: An International Journal*, Vol. 18 No. 6, pp. 856-872.

Reichhart, A. and Holweg, M. (2007), "Creating the customer-responsive supply chain: a reconciliation of concepts", *International Journal of Operations & Production Management*, Vol. 27 No. 11, pp. 1144-1172.

Reuter, C., Foerstl, K., Hartmann, E. and Blome, C. (2010), "Sustainable global supplier management: the role of dynamic capabilities in achieving competitive advantage", *Journal of Supply Chain Management*, Vol. 46 No. 2, pp. 45-63.

Reyes, P., Raisinghani, M.S. and Singh, M. (2002), "Global supply chain management in the telecommunications industry: the role of information technology in integration of supply chain entities", *Journal of Global Information Technology Management*, Vol. 5 No. 2, pp. 48-67.

Richey, G.R., Chen, H., Upreti, R., Fawcett, S.E. and Adams, F.G. (2009), "The moderating role of barriers on the relationship between drivers to supply chain integration and firm performance", *International Journal of Physical Distribution & Logistics Management*, Vol. 39 No. 10, pp. 826-840.

Rudberg, M. and Olhager, J. (2003), "Manufacturing networks and supply chains: an operations strategy perspective", *Omega*, Vol. 31 No. 1, pp. 29-39.

Saad, M., Jones, M. and James, P. (2002), "A review of the progress towards the adoption of supply chain management (SCM) relationships in construction", *European Journal of Purchasing and Supply Management*, Vol. 8 No. 3, pp. 173-183.

Sandberg, E. (2007), "Logistics collaboration in supply chains: practice vs theory", *The International Journal of Logistics Management*, Vol. 18 No. 2, pp. 274-293.

Scott, C. and Westbrook, R. (1991), "New strategic tools for supply chain management", *International Journal of Physical Distribution and Logistics*, Vol. 21 No. 1, pp. 23-33.

Shin, H., Collier, D. and Wilson, D. (2000), "Supply management orientation and supplier/buyer performance", *Journal of Operations Management*, Vol. 18 No. 3, pp. 17-33.

Sinha, P.R., Whitman, L.E. and Malzahn, D. (2004), "Methodology to mitigate supplier risk in an aerospace supply chain", *Supply Chain Management: An International Journal*, Vol. 9 No. 2, pp. 154-168.

Skipper, J. and Hanna, J. (2009), "Minimizing supply chain disruption risk through enhanced flexibility", *International Journal of Physical Distribution and Logistics Management*, Vol. 39 No. 5, pp. 404-427.

Soosay, C., Hyland, P. and Ferrer, M. (2008), "Supply chain collaboration: capabilities for continuous innovation", *Supply Chain Management: An International Journal*, Vol. 13 No. 2, pp. 160-169.

Spekman, R., Kamauff Richey, J. and Myhr, N. (1998), "An empirical investigation into supply management: a perspective on partnership", *Supply Chain Management*, Vol. 3 No. 2, pp. 53-67.

Stevens, G. (1990), "Integrating the supply chain", *International Journal of Physical Distribution and Materials Management*, Vol. 19 No. 8, pp. 3-8.

Stonebraker, P. and Liao, J. (2006), "Supply chain integration: exploring product and environmental contingencies", *Supply Chain Management: An International Journal*, Vol. 11 No. 1, pp. 34-43.

Swamidass, P. and Newell, W. (1987), "Manufacturing strategy, environmental uncertainty and performance: a path analytic model", *Management Science*, Vol. 33 No. 4, pp. 509-524.

Szwarc, P. (2005), *Researching Customer Satisfaction and Loyalty: How to Find out What People Really Think*, Kogan Page, London.

Tan, K.C. (2002), "Supply chain management: practices, concerns, and performance", *Journal of Supply Chain Management*, Vol. 38 No. 1, pp. 42-53.

Tan, K.C., Kannan, V.R. and Handfield, R.B. (1998), "Supply chain management: supplier performance and firm performance", *International Journal of Purchasing and Materials Management*, Vol. 34 No. 3, pp. 2-9.

Tannous, G. (1996), "Capital budgeting for volume flexible equipment", *Decision Sciences*, Vol. 27 No. 2, pp. 157-177.

Trkman, P. and McCormack, K. (2009), "Supply chain risk in turbulent environments – a conceptual model for managing supply chain network risk", *International Journal of Production Economics*, Vol. 119 No. 2, pp. 247-258.

Turban, E., Mclean, E and Wetherbe, J. (2004), *Information Technology for Management: Transformation Business in the Digital Economy*, 3rd ed., John Wiley & Sons, Inc.

Upton, D. (1994), "The management of manufacturing flexibility", *California Management Review*, Vol. 37 No. 4, pp. 72-89.

Wong, C.Y., Arlbjørn, J.S. and Johansen, J. (2005), "Supply chain management practices in toy supply chains", *Supply Chain Management: An International Journal*, Vol. 10 No. 5, pp. 367-378.

Xiao, Y. (2015), "Flexibility measure analysis of supply chain", *International Journal of Production Research*, Vol. 53 No. 10, pp. 3161-3174.

Zhang, Q.Y. (2001), "Technology infusion enabled value chain flexibility: a learning and capability-based perspective", PhD thesis, University of Toledo, Toledo, OH.

Zhao, Z., Waszink, A. and Wijngaard, J. (2002), "An instrument for measuring TQM implementation for Chinese manufacturing companies", *International Journal of Quality & Reliability Management*, Vol. 17 No. 7, pp. 730-755.

Zhou, H. and Benton, W.C. Jr (2007), "Supply chain practice and information sharing", *Journal of Operations Management*, Vol. 25 No. 6, pp. 1348-1365.

Zhu, Q., Sarkis, J. and Lai, K. (2007), "Green supply chain management: pressures, practices and performance within the Chinese automobile industry", *Journal of Cleaner Production*, Vol. 15 Nos 11-12, pp. 1041-1052.

Zimmermann, F. and Foerstl, K. (2014), "A meta-analysis of the 'purchasing and supply management practice-performance link", *Journal of Supply Chain Management*, Vol. 50 No. 3, pp. 37-54.

Further reading

Arif-Uz-Zaman, K. and Nazmul Ahsan, A.M.M. (2014), "Lean supply chain performance measurement", *International Journal of Productivity and Performance Management*, Vol. 63 No. 5, pp. 588-612.

Li, Z. and Kumar, A. (2005), "Supply chain network scenario design and evaluation", *International Journal of Logistics Research and Applications: A Leading Journal of Supply Chain Management*, Vol. 8 No. 2, pp. 107-123.

Najmi, A. and Makui, A. (2010), "Providing hierarchical approach for measuring supply chain performance using AHP and DEMATEL methodologies", *International Journal of Industrial Engineering Computations*, Vol. 1 No. 2, pp. 199-212.

Zarei, M., Fakhrzad, M.B. and Paghaleh, M.J. (2011), "Food supply chain leanness using a developed QFD model", *Journal of Food Engineering*, Vol. 102 No. 1, pp. 25-33.

Appendix 1

Instrument developed to investigate (a) SCM practices adopted by Jordanian manufacturing firms, and the relationship between these practices with (b) SC and (c) firms' performance

(a)

STRATEGIC SUPPLIER PARTNERSHIP

Relationship and criteria of strategic supplier

1) Our firm relies on a few high quality suppliers.
2) Our firm considers quality factor one of main criterion in selecting our suppliers.
3) Our firm provides any help to improve the quality of suppliers' products.
4) Our firm has continuous improvement programs that include our key suppliers.
5) Planning and goal-setting activities in our firm are included in our key suppliers.
6) New product development processes in our firm is included in our key suppliers.
7) Our firm certifies our suppliers for quality.

Trust of strategic supplier

8) Our suppliers dealing with us in open and honest way.
9) Our suppliers have high reliability.
10) Our suppliers deal with the information that provided by us in a confidential way.
11) Our transactions with suppliers don't have to be closely monitored /supervised.

Commitment of strategic supplier

12) There is a willingness from our suppliers to provide us with a lot of assistance without exceptions.
13) We expect to leverage the business between us and our suppliers in the future.
14) Our suppliers are highly committed to the agreements signed by us.

Shared vision with strategic supplier

15) There is a matching between us and our suppliers to understand each others' business policies and rules.
16) There is a similar understanding between us and our suppliers about the aims and objectives of the supply chain.
17) There is a similar understanding between us and our suppliers about the importance of improvements that benefit the supply chain as a whole.

LEVEL OF INFORMATION SHARING

18) In case of any change needed, our partners will be informed in advance.
19) Our firm sharing proprietary information with trading partners.
20) If there is any issues that might affect our firm, our trading partners will keep us fully informed.
21) Our trading partners share firm knowledge to develop our core Firm's processes.
22) Our organization exchange information with trading partners to establish our business planning.
23) Our organization keeps in touch frequently with our trading partners and informs each other about any changes/events that may affect the other partners.

QUALITY OF INFORMATION SHARING

24) Information exchange between our organization and our partners is timely.
25) Information exchange between our organization and our partners is accurate.
26) Information exchange between our organization and our partners is complete.
27) Information exchange between our organization and our partners is adequate.
28) Information exchange between our organization and our partners is reliable.

CUSTOMER SERVICE MANAGEMENT

29) Our firm frequently interacts with customers to be responsiveness, reliable, and other standards.
30) Our firm frequently follow-up and monitor our customers for quality/service feedback.
31) Our firm frequently measure and evaluate customer satisfaction.
32) Our firm frequently tries to determine future customer expectations.

33) Our firm provides and facilitates any assistance for our customers.
34) Our firm periodically assesses the importance of our relationship with our customers.

INTERNAL LEAN PRACTICES

35) The firm policy looking for reducing set-up time.
36) Our firm adopts a "Pull" production system.
37) Our firm pushes and encourages suppliers for shorter lead-times.
38) Our firm streamlines ordering, receiving, and other works from suppliers.
39) Suppliers' warehouses/factories are located very close.

40)Time has been reduced for inspection of the incoming materials/components/ Products

POSTPONEMENT

41) Our products are designed for modular assembly.
42) Production process in our firm can be re-arranged and some processes can be carried out later on at distribution centers.
43) Our firm is able to delay assembly activities for final product until customer orders have actually been received.
44) Our firm is able to delay assembly activities for final product until the last possible position (or nearest to customers) in the supply chain.
45)Our goods are stored at appropriate distribution points close to the customers in the supply chain.

TOTAL QUALITY MANAGEMENT

Top management commitment

46) Top management in our firm is actively develops an integrated quality plan to meet business objectives.
47) Top management in our firm encourages employee to be involvement in quality management and improvement activities.
48) Top management in our firm offers all resources required for employee education and training.

Continuous improvement

49) Our firm has an accurate and efficient database that provides information on internal operations, costs, and finances.
50) Production equipment is maintained frequently according to maintenance plan
51) Our firm implements various inspections effectively and frequently
52)Our firm uses quality control and statistical process control for process control and improvement.

Employee involvement

53) Our firm has quality circles and cross-functional teams.
54) Employees in our firm have an opportunity to be actively involved in quality-related activities.
55) Employees have a high responsibility and very committed to the success of our firm.

Reward and recognition

56) Our firm has a salary promotion and incentives for encouraging employees' participation in quality improvement.
57) Excellent suggestions are appreciated from our organization and financial rewarded.
58) Employees' rewards and penalties are obvious and clear for all in our firm

Education and training

59) Employees in our organization are encouraged to accept new skills and training programs.
60) Our firm offers all resources required for employees training programs.
61) Most employees in our organization are trained on how to use different equipment and tools.

Customer focus

62) Our firm collects extensive complaint information from customers
63) Our firm has a program to maintain good customer communication.
64) Our firm treats customer complaints based on quality criteria and with top priority.
65) Our firm always conducts a customer satisfaction survey annually and collecting their suggestions for improving our products.

Product quality

66) The reliability of the primary products in our firm is increasing.
67) The durability of the primary products in our firm is increasing.
68) The performance of the primary products in our firm is increasing.
69) The defect rates of the primary products in our firm are decreasing.

(b)

FLEXIBILITY OF SUPPLY CHAIN

1) Our supply chain is able to deal with different nonstandard orders.
2) Our supply chain is able to offer special customer specifications.
3) Our supply chain is able to produce different features of products such as: options, sizes, and colors.
4) Our supply chain is able to adjust capacity (accelerate/decelerate) in production regarding to rapidly customer demand changes.
5) Our supply chain is able to introduce large numbers of product improvements.
6) Our supply chain is able to offer/introduce new products for customers.
7) Our supply chain is able to respond to the needs and wants of the firm's target market.

INTEGRATION OF SUPPLY CHAIN

8) All functions in our firm have high level of coordination communication.
9) Cross-functional teams are usually used for process design/improvement in our firm.
10) Information systems encompass all functions in our firm, which provide high level of integration.
11) There are many cross-over activities between our firm and our trading partners.
12) There is a full system visibility in our supply chain from suppliers' suppliers to customers' customers.

RESPONSIVNESS TO CUSTOMERS

13) Our firm fills customer orders on time without delay.
14) Our firm has short order-to-delivery time.
15) Our firm is fast in customer response time.

SUPPLIER PERFORMANCE

16) Our suppliers provide us materials/components/products on time without delay.
17) Our suppliers provide dependable delivery to our firm.
18) Our suppliers are highly reliable when provide us materials/components/products
19) Our suppliers provide our firm high quality of materials/components/products.
20) Our suppliers provide our firm materials/components/products at lowest cost.

(c)

FIRM'S PERFORMANCE

	Value (%)
1) Market share.	
2) Return on investment.	
3) The growth of market share.	
4) The growth of sales.	
5) Growth in return on investment.	
6) Profit margin on sales.	
7) Overall competitive position.	

Note: Could you please, if there is any question is not obvious for you or any explanation, don't hesitate to contact the researcher on the address below:

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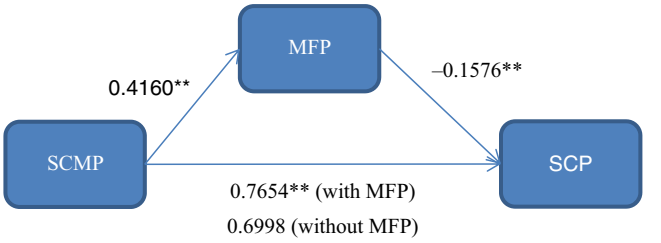
THANK YOU FOR YOUR PARTICIPATION AND ASSISTANCE TO SUCCES THIS RESEARCH SYUDY

Appendix 2



Indirect effect of SCMP on SCP

–0.0656** (CI –0.1318, –0.0257)

Figure A1.
Mediation analysis

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M. Reza Abdi has 20 years of academic and industrial experience in the areas of manufacturing engineering and production management. His specialist research area encompasses manufacturing systems design, decision support systems and operations management. He has published various papers in highly regarded peer-review journals and acted as a Conference Chair and delivered keynote lectures for a number of international conferences. He has successfully supervised six PhD theses and acted as an External Examiner for several PhD candidates in the areas of supply chain management, multi criteria decision making, six sigma and TQM, and data mining and computer simulation.