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The Integration of Extended Supply Chain with Sales and Operation Planning: A Conceptual Framework

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Abstract: This research is an effort to present the emergence of ways to enable marketers to attain high sensitivity and visibility in the supply chain network. It also aims to facilitate better multi-criteria decisions throughout the extended supply chain. It is a qualitative study considering 31 published research articles related to supply chain integration, sales and operation planning, and the use of information systems. With a focus on narrative data, a purposive sampling technique was used to select the papers for review and to produce the results of this study. The findings of this research indicate that the sales and operation planning (S&OP) processes and the key operations in the supply chain network need to be fully integrated. The findings also indicate that information system resources are the key enabler of S&OP and supply chain integration. To be specific, this research is an exercise in theorizing a conceptual framework for optimally confronting the emerging challenges and opportunities regarding an extended supply chain and is intended to bring the proficiency of multi-criteria decisions and actions in the entire supply chain network.

Keywords: supply chain integration; sales and operation planning; information systems; multi-criteria decisions; information flow

1. Introduction

A well-integrated sales and operation planning (S&OP) provides a blueprint for enabling the effective management of a company's supply chain [1]. Similarly, the supply chain (SC), which is synchronized with the information systems, has become inevitable for companies to support and maintain strong customer relationships [2]. In general, organizations use information systems to support their operations, processes, management, and decision-making [3]. The electronic communication networks, e-commerce, and point of sale (POS) are some great developments in information systems. In these days of high competition, companies need to make swift changes to business processes to respond to opportunities and threats in the marketplace [4]. It has also become more essential for companies to keep balance with the emerging technological shifts and flexibilities in the offering and partnering in the supply chain network [5]. Importantly, a free and faster information flow requires companies to hold enterprise agility and strategic agility, i.e., to understand environmental changes and stay proactive accordingly [6]. Such abilities also become efficient tools for eliminating different trade barriers, providing global logistics, and fostering order processing.

Nowadays, companies are allocating a mentionable amount of their budget to acquire and maintain long-term relationships with their customers. Much effort is made to implement S&OP processes to satisfy customers' requests by facilitating efficient supply–demand decisions [7]. The academic literature has evidenced that the S&OP process has become predominantly customer-centric [8]. Virtually, it focuses on the re-planning of previously agreed operation plans to increase the likelihood of achieving the desired results [8]. The effective and efficient attainment of the desired targets requires to constantly review the entire supply chain network [9]. In addition,

quality communication, commitment, and trust and satisfaction are some critical factors to maintain quality relationships in the supply chain [10]. To attain sustainability in competitive advantage, a firm requires to ensure effective alignment between its marketing strategies, implementation plans and industry contexts in which it operates [11]. The marketers can convert indifferent customers into loyal ones through a quality relationship with them [12]. Irrespective of the entire supply chain, customer service is an important element in the integrated supply chain performance [13] and is regarded as a key component of the extended supply chain network [14].

This review focuses on the information needs of the key partners throughout the supply chains of enterprises. Particularly, this research includes the study of extended supply chains, sales and operations planning (S&OP), and information systems (IS) which facilitate stable production, shorter lead times, higher forecast accuracy, lower inventory and distribution costs, and cost and profit planning for the suppliers, as well as newer products, higher quality and service level, flexibility, on-time delivery, and higher satisfaction for the customers. As a backdrop to this, there are four major objectives: first, to understand the forces that influence either directly or indirectly the key decisions in supply chain integration; second, to find out the key entities that are associated with the key decisions in the supply chain; third, to find out the dependency of the key decisions on the information systems and sales and operation planning; fourth, to propose a conceptual model of the integration of S&OP with the extended supply chain network. To help with the understanding of the different issues relating to the SC, S&OP, and IS, 31 different theoretical and conceptual articles are reviewed. In this setting, 10 articles are reviewed to provide insights into supply chain integration, 10 are reviewed to provide insights into the integration of the sales and operation planning process, and 11 are reviewed to provide insights into the enablers of the integration and the influencing forces and entities in supply chain decisions. To achieve the aims of this research, 12 factors are selected purposively to create a multi-criteria decision requirement for suppliers' success. Website visits are conducted with different keywords such as 'customer relationship', 'satisfaction', 'information flow', 'demand forecasts', 'lead time', 'online processing', 'integration', and so forth in order to achieve a clearer understanding of S&OP and extended SC. A conceptual model of integrated S&OP and extended supply chain network based on the research findings is presented.

2. Concepts and Definitions

Communicating value and managing customer relationships have become essential to understand customer behaviors and the emerging nature of customer expectations [15]. Strong customer relationships lead to high customer loyalty, which results in better customer satisfaction [16]. One pivotal factor for the success of a focal firm is the adoption of an effective multi-criteria decision that evaluates multiple conflicting elements in a decision process [17]. To provide better customer service and to cope with changes, companies are now endeavoring to build resilient supply networks [18]. The traditional concept of the supply chain as 'the process of moving products from supplier to customer' has been transformed into an extended form [19]. Classically defined, a supply chain is a material and information flow system, which includes five elements: (a) the initial supplier; (b) the supplier; (c) the manufacturer; (d) the customer; (e) the final customer. Conversely, resilient supply networks include four levels: (a) the reactive management of the supply chain; (b) the integration of the internal supply chain; (c) collaboration across the extended supply networks; (d) the flexibility of the supply chain, which vitally contributes to the attainment of the resilience of the focal firm [20].

In the emerging dynamic environment of the recent years, firm resilience has become a must-have feature for companies in order to seek opportunities and face challenges [21]. The possibility of sustaining firm resilience depends upon properly defined and managed resources throughout the entire supply chain, including customer service, customer satisfaction, customer retention, and risk management [22]. Companies are now seeing customer satisfaction as a key dimension for shaping their business strategies, with a focus on superior customer service [23]. Usually, sales and operation

planning (S&OP) directly connects a company's marketing plans to its business operations [24]. It also functions as a tool for setting the overall inventory, production, sales, forecast, and profitability planning [25]. Besides, the competitive structure of the market has forced the companies to reshape their products, re-skill people, redesign processes, and use information systems [26,27]. In addition, companies require to integrate communication, information sharing, and planning between the sales and marketing on one end with the production and supply chain on other end, for an effective use of the S&OP process [28]. To take effective decisions and to face the challenges in the ever dynamic and uncertain marketplace, a company's business strategies must sync to its IS functions [29]. Thus, IS and S&OP require functioning at a juncture to allow making efficient decisions throughout the supply chain. However, designing a suitable plan and demand forecast to define an effective supply chain strategy is a core challenge. The inefficiency in demand forecast and poor supply capacity usually result to instability in the supply chain network [30]. The demand patterns in the marketplace are enormously volatile, often resulting from global economic uncertainties and slow-moving logistics [31].

Besides, once a company launches a new product, it needs to develop new sales forecasts and coordinate the supply chain activities, which is very challenging and dicey to do frequently. Many'companies often use outsourcing of parts of their supply chain operations for additional economic benefits and enhanced logistical performance [32]. The more a product is successful in the global market, the more likely the production leaves the company's home country [33]. Therefore, the focal companies need to locate their facilities to foreign countries [34], which requires large investments [35]. On the other hand, outsourcing brings in trained and expert employees and reduces the company's requirements of capital and operating expenses [36]. In facing these challenges, companies depend on consumer spending [37]. Such dependency can be lessen by outsourcing [38]. However, a study showed that the evolving and dominant trend of outsourcing often fails to produce the expected returns for various reasons, such as overexpectations, poor management, and hidden costs (Figure 1).

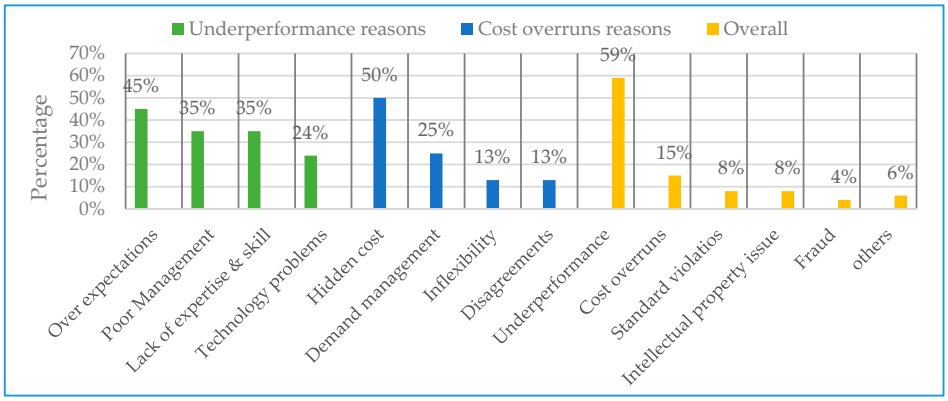

Figure 1. Outsourcing failure reasons. The study was conducted by Deloitte Development LLC in 2005. The participants represented 25 world-class organizations in different sectors. Nearly half of the participants were part of the Fortune 500. Six were part of the Fortune 50, and three were ranked in Fortune Global 100. Ten participants were members of the Dow Jones Composite Index and/or the Standard & Poor's 500.

According to a very recent research, many firms fail to bring benefit through outsourced logistics partnership because of their limited capability in information technology, referred to as IT gap [39]. The generation of optimal value through an outsourced supply chain depends on the extent of inclusion of the outsource partners, on chain network design, control mechanism, and, most vitally, information systems for coordination, synchronization, and integration [40]. Hence, in bringing outsourced partnership, compelling effective information systems and attaining efficiency in managing the different players in the outsourced supply chain should be prioritized.

Integration simply combines the efforts of different entities in a supply chain to work in sync to attain a jointly developed and agreed goal through information sharing. The integration intensity is regarded as the prevailing factor in effective supply chain [41]. It supports the key processes in the supply chain network and enables the key actors therein to well coordinate their functionalities [42]. There is a positive relationship between integration and supply chain performance [43]. In addition, the IS integration with the SC helps increasing efficiency and visibility and reduces transaction costs [44].

Many companies over the world are focusing on 'top-down' and 'bottom-up' approaches in forecasting their S&OP process [45]. S&OP is an integrated decision-making process that leads to different strategic and operational plans [46]. Such plans include a strategic initiative plan, a sales and production plan, a product development plan, an inventory plan, a lead-time plan, and a resulting financial plan. Essentially, executives are the key actors in the S&OP process, who strategized to transform the way a company operates, thereby raising the potentials of target achievement [47]. The evolving demand economy also increases the need of companies for quality planning and forecasting. To face such challenges, demand-driven S&OP has appeared as a promising option to serve customers with on-time responses [48]. S&OP also supports a lot the sales and marketing and enables cross-functional alignments to other commercial activities. In addition, it brings different cost avoidance initiatives throughout the supply chain network [49].

To reach the research objectives, the following section clarifies and rationalizes the need of integration of S&OP processes into SC strategies and functionalities, by a review of the extant literature.

3. Review and Discussion

The review and discussion of literature in this study considers 31 research works published during the last 15 years in different journals, covering three key areas: (a) sales and operation planning, (b) supply chain integration, and (c) information systems (Table 1). The major issues covered are: S&OP integration, SC integration, relevant multi-criteria decisions in the SC network, other relevant key issues and Enablers of S&OP and SC integration, and IS examples.

Table 1. Number of Papers by Journal (N = 31).

Name of the Journal	No. of Articles
Academy of Management Journal	1
Business Process Management Journal	1
Computers in Industry	1
European Journal of Operational Research	1
Information and Management	3
Information Systems and e-Business Management	1
International Journal of Operations and Production Management	2
International Journal of Physical Distribution and Logistics Management	2
International Journal of Production Economics	4
International Journal of Production Research	1
Internet Research: Electronic Networking Applications and Policy	1
Journal of Operations Management	2
Journal of Research in Interactive Marketing	1
Journal of Supply Chain Management	1
Management Research News	1
MIS Quarterly	1
Production Planning and Control	1
Supply Chain Management Review	2
Supply Chain Management: An International Journal	3
The International Journal of Logistics Management	1
Transfusion	1
Total	**31**

3.1. General Methodology and Selection of the Papers

The amount of literature on S&OP, SC, and IS are growing rapidly. For the present study, 21 journals were selected that can be considered as major journals within the areas mentioned in Section 3. From these journals, 31 papers from 2002 onwards were identified with the keywords integration and enablers indicated in the abstract, plus one or more words including S&OP, supplier, supply chain, and information systems. In this selection process, abstracts were assessed to establish whether the papers really fitted with the research objectives, that is, whether they reported research on the relationship between IS-enabled S&OP process and benefits and SC integration and performance of the key parties in the supply chain; if these criteria were not met, the papers were rejected. The distribution of these papers across the 21 journals is shown in Table 1.

3.2. S&OP Integration

The sales and operations planning (S&OP) matches supply and demand planning over an intermediate-term planning horizon and is a routine tactical planning process [50]. Successful S&OP processes are driven mostly by the top executives of focal firms [51]. The vital components of S&OP include comparing forecasts to the operating budget, aligning tactical plans to strategic plans, having a portfolio management process, and going over alternative scenarios for better decisions [52].

The market intelligence and key business performance metrics are two vital properties for synchronizing the demand and supply plans through the S&OP process. The increasing velocity in the supply chain, the volatility of customers' demand, and the shorter life cycles of the products are new challenges for the coordination and integration of different functionalities in the supply chain network, which can be met effectively through an effectual integration of the S&OP process. Simply sharing data is not sufficient to improve S&OP integration [53]. The successful implementation of the S&OP process significantly depends upon the cross-functional integration and use of information systems and the support of the top management [54]. To ensure successful business plans, the S&OP process must accommodate all supply, demand, and new product plans. Also, by including key customers, suppliers, and other the key people into the S&OP process and by sharing information and different plans, the performance of a company's supply chain can be improved [55].

In essence, organizations usually create knowledge through intuiting, interpreting, integrating, and institutionalizing. The S&OP usually enables an organization to do so and thereby leads to better organizational performance [56]. Since S&OP influences the supply chain by enabling a proper management of resources and customer satisfaction, it has also been regarded as the enabler of the supply chain integration [57]. Moreover, the improvement of S&OP encourages better synchronization of supply and demand, sustainability of performance, and minimal inventory, wastage, and working capital [58].

3.3. SC Integration

Manufacturers and marketers usually aim to achieve superior performance to provide maximum value to their customers through the effective and efficient flow of products and services, information, money, and decisions. Supply chain integration (SCI) is the extent to which the manufacturers and marketers strategically cooperate with their supply chain partners and collaboratively manage the intra- and inter-organizational processes [59]. In this age of increasing global competitions, organizations need to be more cautious in supply chain partnerships [60]. Also, priority needs to be placed on the joint improvement of inter-organizational processes [61]. To enable a focal firm to do so, SCI has been viewed as an effective way [62]. Also, SCI encompasses a variety of processes in the supply chain network, such as administrative activities, material flow, and transportation [63].

The supply chain integration (SCI) offers a variety of performance outcomes for the focal firm, including: operational and economic effectiveness [64], competitive capabilities and business performance [65], customer service and financial performance [66], cost, stock and lead time

reduction [67], and product innovation and quality [68], to name a few. According to the contingency approach to SCI, the focal firm needs to align its structures and processes with the evolving environment, in order to maximize its performance [69]. In addition, the structural contingency theory emphasizes that the alignment of individual dimensions of the SCI are also crucial to produce superior supply chain performance [70].

3.4. Multi-Criteria Decision in SC

A multi-criteria decision is defined as a process in which multiple conflicting criteria have to be considered to evaluate different options, resulting in varying decision outcomes [71]. There is a number of conflicting criteria on the basis of which we have to take different decisions in our personal life and business setting as well, such as reaching more safety and comfort at a lower cost or attaining higher customer satisfaction at a minimum cost of customer service [72]. Interestingly, there are many conflicting criteria in a company's supply chain decisions, including the supplier's selection factors and the suppliers' performance criteria with respect to cost, quality, delivery time, and level of customer service [73]. Also, while facing such decision problems, input information could be insufficient, thus limiting the decision makers' ability to appropriately make supply orders and therefore leading to poor supply chain performance on cost, quality, and service [74].

In this research, 12 supply chain decision criteria are considered for their importance in shaping the S&OP process and SC integration. The attempt is also intended to gauge the relevancy of these criteria for the key players throughout S&OP and the extended SC network. Among the 12 criteria, 6 are considered from the viewpoint of suppliers and 6 are considered from the viewpoint of customers (Table 2).

Table 2. Multi-criteria decision sets for sales and operation planning (S&OP) and Extended Supply chain integration.

Author(s)	Year	Method	Multi-Criteria Decision Sets												Ref.
			Suppliers' End							Customers' End					
			Production Stability	Reduced Lead Time	Reduced Inventory	Forecast Accuracy	Distribution Cost	Cost/Profit	New Product	Service Level	Quality	Flexibility	On-Time Delivery	Price/ Satisfaction	
S&OP															
Ivert et al.	2014	Survey	√						√	√					[75]
Godsell et al.	2010	Case Study					√		√				√		[76]
Mellen et al.	2010	Longitude Study		√	√	√	√			√					[77]
Chae	2009	Review		√		√		√					√		[78]
Singh	2010	Review				√	√	√							[79]
Thome et al.	2014	Survey									√	√	√		[80]
Paiva	2010	Survey			√									√	[81]
Olhager	2010	Case Study		√								√			[82]
Goh and Eldridge	2015	Case Study		√	√	√									[83]
Keal and Hebert	2010	Survey				√		√		√				√	[84]
SCM															
Koh et al.	2006	Case Study and Interview		√			√						√		[85]
Bose et al.	2008	Case Study		√	√							√			[86]
McLearn et al.	2002	Literature Review			√	√	√	√		√				√	[87]
Hult et al.	2004	Questionnaire Survey		√	√				√		√	√			[88]
Feng et al.	2008	Experimental			√	√		√							[89]
Leuschner et al.	2013	Survey						√	√		√	√	√		[90]
Bagchi and S-Larsen	2005	Survey					√	√					√		[91]
Boon-Itt and Paul	2006	Survey	√					√	√		√		√		[92]
Quesada et al.	2008	Survey								√	√	√	√		[93]
Wong et al.	2011	Questionnaire Survey							√		√	√	√	√	[94]

3.4.1. Suppliers' End

Production Stability

Production stability has been viewed as a significant dimension for supply chain integration and agile supply chain practices, whereas agility propels the focal firm to achieve mass customization and to master change and uncertainty through routinely adaptable structures and information technology [95]. In the selected papers, production stability is considered to be a (10%) significant criteria in S&OP and SC integration.

Reduced Lead Time

Lead time reduction is a key factor in aligning a firm's production with its actual customer demand. Supply chain actors need to focus on the reduction of lead time to improve the performance of the demand chain [96]. The reduction of lead time also received much attention as an important supply chain decision variable leveraged by dual-sourcing and inventory models such as Just-in-time (JIT) strategy [97]. Amongst the studies reviewed in this article, 35% of the papers considered it as a significant criterion for S&OP and SC integration. Research also showed that, lead time is a driving factor for obtaining competitive advantage and efforts on time-based dimensions of products have become more essential considerations in supply chain network [98].

Reduced Inventory

Reduced inventory has been regarded as a critical factor for inventory-related cost reduction in the supply chain network. It is predominantly connected to the supply chain integration. Because, it pushes the key actors in the supply chain and the S&OP decision makers to take collaborative initiatives, such as vendor-managed inventory (VMI) systems [99]. Also, in this research, 35% of the sample validated that reducing the level of inventory is widely considered an important criterion for S&OP and SC integration. Research also showed that information technology synced with other supply chain partners leads to reduced inventory levels and improves JIT environment within the focal firm [100].

Forecast Accuracy

Forecasts are essential to the planning processes and supply chains decision-making. Comparatively, a better structuring of prices and better management of inventories can be achieved through better demand forecasting. Schemes such as Collaborative Planning, Forecasting, and Replenishment (CPFR) are being assessed by firms to facilitate forecast sharing amongst the supply chain partners and to improve forecast accuracy levels in order to attain higher profitability [101]. In this study, 35% of the examined papers demonstrated that forecast accuracy is a pivotal driver in the integration of the S&OP process and supply chain functionalities.

Distribution Cost

Distribution, as a concept, includes a diverse range of activities, such as logistics, transportation, warehousing, inventory management, channel management, and selection of channel partners [102]. Historically, distribution has been regarded as one of the fundamental part of supply chain and independently each firm establishes large buffer inventories to manage it [103]. However, the recent changes have made firms become highly interdependent. In a supply chain network, the costs of distribution provide the basis for planning and other decisions, including capacity, location, and number of warehouses [104]. Amongst the sample chosen in this study, 30% of them admitted the necessity of considering distribution costs as a driving force behind S&OP and SC integration decisions.

Cost/Profit Planning

Maintaining the cost as low as possible has long been a vital issue in the integrated SC network [105]. Usually, a vital portion of costs in the SC includes planning over the holding and ordering costs. To investigate the effects of multiple parameters on the supply chain cost, various models have been created, including the widely used classical model EOQ [106]. Among others, the PILOT model considers raw material suppliers, production facilities, distribution centers, and retailers as the elements of the supply chain network and especially indicates production and inventory movement costs as the basis of the resulting decision outputs, such as the production and distribution facilities that should be opened, the immediate quantity of inventory to order, the needed quantity of product to produce, and the necessary quantity of product to consign [107]. Researchers also suggested objective functions in the deterministic model to facilitate planning for supply chain profit maximization [108]. In this study, 40% of the sampled articles identified cost/profit planning as a vital criterion for SC and S&OP integration decision.

3.4.2. Customers' End

New Product

The introduction of new products has been viewed as an important driver of supply chain integration [109]. Regardless of the attention to the internal focus, the dynamic nature of the marketplace pushes the company's to pay large attention to the market and customers [110]. Recently, researchers also placed intense focus on the involvement of customers in new product development [111]. Because of the emerging nature of information sufficiency, customers may become dissatisfied with the existing products and wish for new products [112]. The introduction of new products in the marketplace has been indicated by 30% of the sampled articles as a criterion that emphasizes the need of S&OP and SC integration.

Service Level

Customer service typically meant to assist the customer before, during, and after a purchase. A company can generate more financial benefits through efficiently providing customer service [113]. A better customer service is also a significant tool for attaining a sustainable customer relationship [114]. Essentially, customer service regards a variety of areas, including assisting in purchase planning, product installations, troubleshooting, maintenance, package updating, disposal, and so forth. An increased level of customer service in the logistic functionalities can lead to a greater customer satisfaction and loyalty [115]. In this study, 25% of the sampled papers indicated the service level to customer as an important criterion for S&OP and SC integration decision.

Quality

Quality has been regarded as one of the most essential attributes of the products or services offered to customers. The behavior of the customers towards a company vitally depends upon the quality the focal firm supplies [116]. The profitability of a company's production systems is strongly related to the extent to which it offers quality. Also, the subsequent purchase behavior of a customer significantly depends upon the level of the quality of the first purchased product [117]. Amongst the reviewed articles, 30% identified quality as an essential decision criterion for the integration of S&OP processes with supply chain functionalities.

Flexibility

Flexibility has long been a key priority for focal firms for perform better in the market place [118]. It is much easier for companies to attain competitive advantage and high customer satisfaction if they have flexibility in logistic functionality [119]. Flexibility also enables a high supply chain

performance [120]. Interestingly, the implementation of IS in the supply chain offers more flexibility toward the customers [121]. Among the papers examined in this study, 35% considered flexibility as a criterion for S&OP and SC integration decision.

On-Time Delivery

Real-time integrated S&OP has become a focal issue for organizations [122]. Usually, the manufacturers and marketers need to be much careful with lead time to serve the customers on-time. In this age of emerging supply chain uncertainties, a tool as the APS benefits a company's S&OP processes and results in ensuring on-time delivery to their valued customers [123]. In this study, 45% of the articles recognized on-time delivery as a vital issue to take under consideration to emphasize the need of S&OP and SC integration.

Price/Satisfaction

Customer satisfaction is defined as the extent to which a company's offering meets the expectations of customers. It is regarded as the key indicator of customers' purchase intentions and loyalty [124]. Research showed that the price vitally influences the level of customer satisfaction [125]. Amongst the articles examined, 20% considered price and related customers' satisfaction as a criterion for S&OP and SC integration decision.

3.5. Key Issues in S&OP and SC Integration

Aside from the factors described above, this research is as exertion to propose a conceptual model for S&OP and Extended SC integration, by synthesizing the direct and indirect forces associated with S&OP and SC integration and by clarifying the way the key enablers (Table 3) facilitate the S&OP process and key supply chain decisions and functionalities. The review of selected papers clarifies these issues, whose the details are reported in the following (Table 4):

Table 3. Reviews on integration enablers and key integration areas for better supply chain (SC) performance.

Author(s)	Year	Method	Enablers	Key Variables	Key Entities	IS Example	Ref.
Koh et al.	2006	Case study and Interview	IT	Financial control Supply planning Demand planning	Supply chain partners	Enterprise Resource Planning (ERP)	[85]
Bose et al.	2008	Case study	IT	Information flow Physical operations	Supply chain partners, Environment	ERP	[86]
McLearn et al.	2002	Literature review	ICT	Market intelligence Information flow Physical operations	Supply chain partners, Other partners	Electronic Data Interchange (EDI), Business to Business (B2B), Business to Customer (B2C), ERP	[87]
Rai et al.	2006	Questionnaire survey	IT	IT infrastructure SC processes Demand predictability Firm size Operational excellence	Supply chain partners Customers Competitors	Web-enabled SC	[126]
Lin	2014	Field survey	Socialization	Partnership quality Communication quality Trust and commitment	Supply chain partners	e-Business	[127]
Plank and Hooker	2014	Literature review	IS	Customers' replay Interactive marketing	Partners in the supply chain	B2B, B2C	[128]
Gunasekaran and Ngai	2004	Literature survey	ICT	Competitors Customers Technology and Marketing	Supply chain partners	EDI, B2B, Web	[129]
Iyer et al.	2009	Review	IS	Financial, market and operational performance Product turbulence Demand unpredictability	Supply chain partners Business environment	B2B	[130]
Li et al.	2009	Questionnaire survey	IT	IT implementation Supply chain performance	Supply chain partners	Information Technology (IT) Tools	[131]
Cagliano et al.	2003	Survey	IT	Competitive Strategy Supply and Demand integration	Supply chain partners	Internet-Tools	[132]
Prajogo and Olhager	2012	Questionnaire survey	IT	Information flow Material flow Supplier relationship Operational performance	Supply chain partners	IT Tools	[133]
Frohlich and Westbrook	2001	Questionnaire survey	IT	Supply chain strategies Operational performance Supplier-customer integration	Manufacturer Supplier Customer	EDI	[134]
Simatupang et al.	2002	Review	IS	Logistics sync Collective learning Market globalization Technological breakthrough	Supply chain partners	IT Tools	[135]
Kim	2006	Questionnaire Survey	Capabilities	Interactive relationship Integrations Performances	Internal and external SC entities	Nation-wide information network	[136]

Table 4. Major annotations and findings of researchers on S&OP and SC issues.

Issues	Factors	Starting Annotations [+] and Findings [‡]	Ref.
Integration	Supplier–customer integration Supply–Demand integration Internal and external integration	Integration level of supplier impacts the S&OP's success [‡] Functional areas of organizations need integration [+] S&OP implementation provides better SC performance [‡] Integration of SC with ERP systems enhances performance [+] Integration need between customer, supplier, and other partners [+] Integrated plan positively related to firm's performances [‡] IT provides higher order of supplier integration [‡] Sociotechnical factors influence SC integration [+] S&OP integrates operations between businesses and customers [‡] The level of customer–supplier integration highly depends on IT [‡] Higher supplier–customer integration gives higher performance [‡]	[80] [81] [83] [85] [86] [87] [126] [127] [128] [132] [134]
Performance	Financial performance Market performance Manufacturing performance Operational excellence Operational performance	S&OP facilitates stable production performance [‡] Manufacturing performance vitally depends upon S&OP [‡] Firms can get better SC performance through S&OP [‡] Integrated plan enhances financial, operational, and market performance [‡] IT integration increases firm's operational excellence and financial gains [‡]	[75] [80] [83] [85] [86] [126]
Communication	Communication quality Collective learning	Collective learning is a mode for coordination in SC [‡] Communication quality significantly impacts SC integration [‡]	[127] [135]
Competition	Competitive Strategy Competitors	Increasing competitions simulates collaboration in supply chain [+] Competitive capability needs to align with SC capability [+]	[135] [136]
Customer	Customers' demand Customers' preferences Customers' replay Customers' satisfaction	New product and customer service level is critical for S&OP [‡] Customer service is a vital metrics for SC performance [‡] Market dynamics impacts S&OP and manufacturing performance [‡] A robust S&OP process can lead to high customer satisfaction [‡]	[75] [78] [80] [84]
Demand	Demand planning Demand predictability Demand unpredictability Product turbulence	Fast-track S&OP initiatives make easier the demand forecasting [‡] Forecast accuracy is one of the vital factors for S&OP's success [‡] IT-enabled SC integration provides improved demand planning [‡] Product turbulence and demand unpredictability negatively impact firm's operational, market, and financial performance [‡] It is critically significant to manage demand uncertainty actively [‡]	[77] [79] [126] [130]
Information and Knowledge	Information flow Information sharing Knowledge coordination	Information sharing is a mode for coordination in SC [‡] Information sharing highly influences logistics coordination [‡] Knowledge coordination positively impact SC performance [‡] Knowledge sharing impacts SC integration [‡]	[127] [133] [135]

Table 4. *Cont.*

Issues	Factors	Starting Annotations [+] and Findings [‡]	Ref.
Information Systems	IT implementation IT infrastructure IT Tools	ERP helps for SC integration [‡] IT tools helps SCM collaboration [‡] Digital platform plays a critical role in SC [+] Sophisticated software are used in S&OP to B2B and B2C process integration [‡] IT largely supports the integration of SCM [‡] SC integration highly depends upon IT implementation [‡] IT Tools capable of logistics coordination [‡]	[86] [87] [126] [128] [129] [131] [132] [133]
Changes	Market globalization Technological breakthrough	S&OP is much vital in change process [‡] Country's development status needs to be considered in S&OP [‡] S&OP can significantly assist in the change process through the organization [‡] Companies are changing their operation strategies to increase flexibility and responsiveness [+] Economy is becoming increasingly globalized and competitive [+] Market globalization, product diversity, and technological breakthroughs stimulate independent firms to cooperate in a supply chain [+]	[76] [80] [84] [129] [131] [135]
Logistics	Logistics sync Material flow Physical operations	S&OP implementation helps decrease the inventory level [‡] Logistics integration highly depends upon IT integration [‡] Material flow between SC partners enhance their operational performance [‡] Logistics sync a mode for coordination in SC [‡]	[83] [133] [135]
Market and Marketing	Interactive marketing Interactive relationship Market intelligence	Firms need to be strategically aligned to market requirements [+] Combined SCM increases market intelligence [‡] Interactive marketing tools are uniquely important B2B marketing [‡]	[82] [87] [128]
Partnership	Partnership quality	Strategic partnership is evolving [+] Digital platform plays a critical role in partnership [+] Sociotechnical factors influence SC integration [‡] Partnership quality mediates the relationship within SC integration [‡]	[87] [126] [127]
Supply chain	Supply planning Supplier relationship Supply chain partners Supply chain performance Supply chain strategies	Supply uncertainty influences production performance [‡] S&OP integration with supply partners impacts production [‡] Firms are increasingly depending on strategies (CODP) to do better Supply chain integration increases SC performance [+]	[75] [80] [82] [133]
Others	Firm's size Environment Business environment Joint planning Trust and commitment	The size of the firm impacts S&OP process and productions [‡] Integration of SCM and ERP systems results in green environment [‡] SCM need to focus on joint planning [+] SC integration enables trust and commitment among partners [‡]	[80] [86] [87] [127]

[+] Indicates the central views of the researchers relevant to S&OP and SC integration. [‡] Indicates the major findings of the researchers relating to constructs and variables associated with S&OP and SC integration.

3.6. Enablers of Integration

Research evidenced that the procurement, production, distribution, sales, and marketing plans can be integrated in S&OP process [89]. The use of information technology (IT) plays a central role in enabling supply chain integration. It allows supply chain partners to increase the extent of information exchange. It also enables sharing of information in real-time, which increases the information visibility in the extended supply chain [131,133]. Amongst the research articles reviewed in this study (Table 3), almost all indicated information systems (IS) as the key enabler of the integration of sales and operation planning (S&OP) with the supply chain (SC). The following critical factors signify that the focal firm's S&OP is synchronized with all its SC partners, and other key parties influence directly or indirectly its decision and functionalities.

(a) The firm is connected through the IS resources to all its stakeholders.
(b) The firm gets inputs of all transactions and remains updated over outside information.
(c) The firm employs competent people to conduct efficiently its S&OP process.
(d) The firm is proactive with regard to its system vulnerability and executes all plan accordingly.

Furthermore, the academic literatures reports that customers usually believe to be very special to their suppliers and expect their suppliers to meet their requirements immediately [137]. Therefore, the focal firm's S&OP needs to aim at extending services through its supply chain, such as responses to customer complaints, after-sale services, and so forth. [138]. To enable these functionalities and to ensure high synchronization with customers, the focal firm can introduce a IS-based feedback systems [139]. Also, meeting the changing demands of customers though newer products, is a key driver of suppliers' success [140]. Initiating a customer-driven supply chain using advanced S&OP can enable suppliers to attain a greater quality [141]. To do so, IS tools would be the best, as they help capture and analyze the vast amount of data regarding customers' requirements, market characteristics, and new ways to deliver products to the marketplace [142].

4. Model Building

Performing continually better in a supply chain is certainly difficult. There is large statistical evidence that even the top firms over the world are experiencing high fluctuations in their supply chain performance [143]. The globally emerging market structure and the dynamically changing customer requirements require firms to find new ways to achieve performance excellence throughout the supply chain network [144]. Also, the review of the literatures carried out in this study evidences that integration has become the dominant issue in achieving a desirable performance outcome highly aligned to customers' expectations. This review also evidences varying impacts of a number of variables on S&OP and SC integration (i.e., Table 4). However, to achieve the conceptual model, which is the research objective, the overall findings of this research are presented as follows:

(a) For better performance, different functional areas of organizations need integration.
(b) With the implementation of S&OP, a better alignment between operational, financial, and marketing plans can be attained.
(c) The integration between customer, supplier, and other key partners in the supply chain network can positively influence the overall performance of the organization.
(d) The S&OP facilitates the integration of operations between business processes and customers.
(e) Different sociotechnical factors impact the level of integration.
(f) IS has been regarded as the key enabler of S&OP and SC integration.
(g) Through an S&OP integrated plan, a company can get better SC performance and therefore can increase its operational excellence.

With the consideration of these findings, a conceptual framework has been established as described below.

In the proposed model, the different internal units in the supply chain network are not treated as interdependent units, but S&OP is incorporated as the mediator of the extent of their interdependence. 'Customer service' is included as the extended element in the SC network. The proposed model also includes a 'two-way communication' process among all supply chain partners and other external stakeholders. All key variables incorporated in the model are adopted from the review outcomes of this study. The straight solid arrows in the diagram indicate the material flow between supply chain partners, the dotted curled arrows indicate the financial flow in the SC network, and the dotted simple arrows indicate the information flow (Figure 2). Yet, the model is expected to function as an integrated process, oriented towards the 'strategic mission' of the organization.

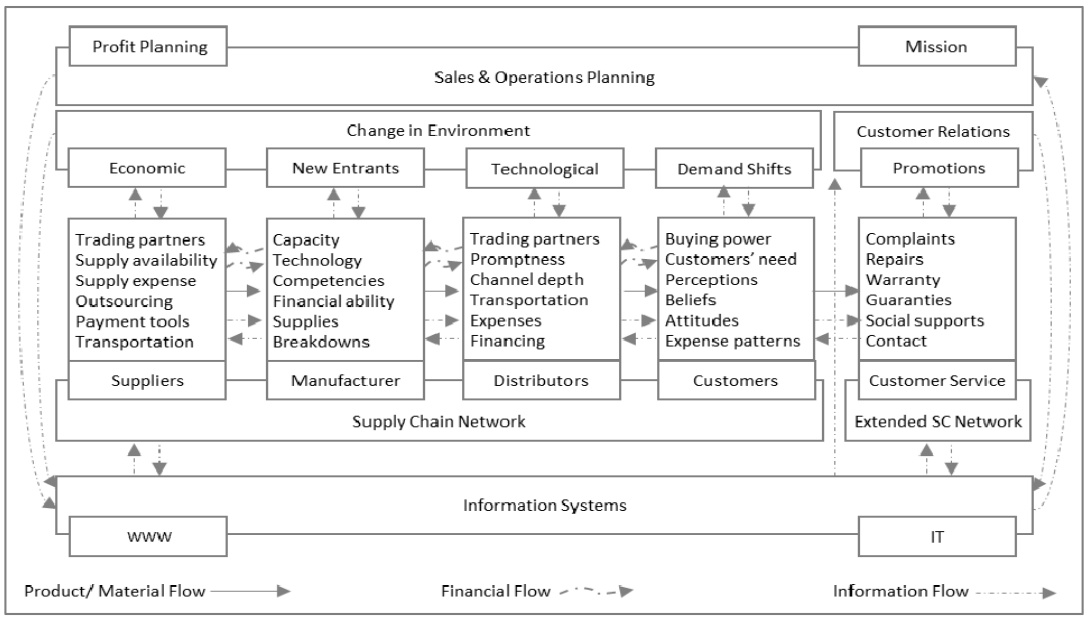

Figure 2. A Conceptual Model of S&OP and Extended Supply Chain Integration.

5. Conclusions, Further Research, and Implications

It has become more challenging to manage the emerging complexity of supply chains because they require taking quick decisions and actions. Operational issues, such as improper synchronization of key processes and use of incompatible information systems by partners, usually create chaos and confusion [145]. In this evolving context, companies need improved performance, for which they often resort to steadfast supply chain practices [146]. It has been established that a robust and fast-track S&OP can confirm a stable supply chain with high operational, financial, and marketing performance (i.e., Table 4).

In this research, some key determinants are identified to support the need for S&OP and SC integration. An effort is also made to include the key internal and external factors that impact the relational and procedural functionalities in the entire SC and S&OP process. The need of open-flow information has also been clearly demonstrated [147,148]. The proposed model also considers current plans and operations, including changed marketing plans through S&OP and SC synchronization. Thus, the application of the proposed model is expected to offer a positive operational and financial performance to the focal firms.

In addition, customers always expect that suppliers will supply products with higher quality [149], whereas suppliers usually aim at the lowest possible cost in supplying products and creating value in the SC network. To face such expectations of customers, suppliers often resort on varying plans such as deciding between in-house production or buying or outsourced production. These conflicting criteria are typically regarded as the multi-criteria decisions in the SC network (Section 3.4). In this research,

only 12 decision factors for reorganizing a supply chain strategy have been considered. However, there are many other factors affecting the supply chain [150]. Besides, the model is predominantly based on a literature review, and this research is fully qualitative in nature. Therefore, the model requires empirical tests to be fine-tuned and improved. Also, the effectiveness and efficiency of IS as the key enablers of S&OP and SC integration need to be empirically tested separately in product SC and service SC.

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