ASSESSING SUPPLY CHAIN MATURITY FOR RETAIL PHARMACY CHAIN

Sara Elzarka
International Transport & Logistics Institute, Arab Academy for Science, Technology and Maritime Transport, Alexandria 1029 Egypt, E-mail: sara_elzarka@aast.edu

ABSTRACT

Retail pharmacy chains have significant impact on Egypt's economy and play a vital role in medicines availability in the local market. Therefore, this research aims to assess the supply chain maturity of one of the top retail pharmacy chains in Egypt using the supply chain maturity assessment test (SCMAT). SCMAT helps in assessing the different performance areas in a company's supply chain to initiate improvement and sustain business competitiveness. This is a qualitative case study that presents in-depth analysis of supply chain activities assessment. A focus group was organized with eleven top and middle managers from the retail pharmacy chain belonging to the following functions: supply chain, logistics, quality management, operations, information technology, customer service, procurement and human resources. In this focus group, participants assessed the level of supply chain maturity of their company. The analysis showed that there are several areas of improvements within the retail pharmacy supply chain which can support the chain in expanding its operations to more cities in Egypt.

Keywords: Retail pharmacy chains, Supply Chain Management, Performance Management, Maturity Test, Egypt.

1. INTRODUCTION

Supply chain management has evolved over the years to include all types of business sectors. As its high importance first arose in the manufacturing sector, it significantly made its way to the service sector as well. The service sector plays a vital role in both developed and developing economies and thus became a significant driving force in the development of the world economy (Wang et al., 2015). According to Baltacioglu et al. (2007) service businesses contribute nearly half of gross domestic product (GDP) in emerging economies which consequently portrays the significant impact of effectively managed service supply chain (SSC). Some researchers predicted that in the future, the world economy will be dominated by services (Arnold et al., 2011; Wang et al., 2015).

Despite the importance of supply chain management (SCM) and specifically its application in the service sector, there is a significant lack in literature on managing the SSC, especially in developing economies such as Egypt. In addition, Zailani and Kumar (2011) have stated that there is a significant gap in SSC research and the implementation of its practices in global literature. And according to Zhang and Chen (2015), one of the essential challenges found in SSC is the lack of standard management framework which can positively impact SSC practices.

Therefore, this research aims to assess the supply chain maturity of one of the top retail pharmacy chains in Egypt using the supply chain maturity assessment test (SCMAT). SCMAT helps in assessing the different performance areas in a company's supply chain to initiate improvement and sustain business competitiveness.

2. LITERATURE REVIEW

2.1 Service Supply Chain

Supply chain has numerous definitions. Basically, a supply chain is a network of flows that link manufacturers, retailers and customers. According to Chopra and Meindle (2013) supply chain management (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". The concept of the service supply chain (SSC) is slightly different. SSC is defined as "the network of suppliers, service providers, consumers and other supporting units that performs the functions of transaction of resources required to produce services; transformation of these resources into supporting and core services; and the delivery of these services to customers" Baltacioglu et al. (2007). Table 1 presents the difference between service and manufacturing supply chains in terms of structure, product form, stability, supply chain co-ordination and performance evaluation as described by Liu (2007).

Table 1. Service and Manufacturing Supply Chain

Item	Service Supply Chain	Manufacturing Supply Chain
Structure	Service provider/service integrator/customer	Supplier/manufacturer/wholesaler/retailer/ customer
Product form	Intangible service	Tangible product
Stability	Lower stability	Higher stability
Supply chain co-ordination	Co-ordination of service capacity & service plan	Co-ordination of production plan & inventory management
Performance evaluation	Based on service operation, which is more subjective & has abstract indicators	Based on the product operation, which is more objective & has indicators that are easy to observe

SSC can be presented into two categories based on the form of the product as stated by Wang et al. (2015): (1) *the service only supply chain* in which the product is pure service, and (2) *the product service supply chain* which combines a physical product and intangible service. For either categories, the management of the SSC should essentially focus on the management of information, processes, capacity, service performances and funds across the supply chain from the earliest supplier to the ultimate customer (Ellram et al., 2007).

However, managing the SSC performance is rather challenging. As Ellram et al. (2007) stated, services cannot be standardized due to their nature of high variability and lack of common features. Baltacioglu et al. (2007) also added that the intangible nature of service requires high level of integration between suppliers and customers to achieve synergy and sustain competitiveness. They proposed that the management of the SSC should be organized according to the following processes: demand management, capacity and resources management, customer relationship management, supplier relationship management, order process management, service performance management and information and technology management. A more recent study by Rezaei Pandari and Azar (2017) described the SSC into the following processes: service delivery management, service delivery management, service-relationship management and customer relationship management, market management, service-capability management, knowledge and information-flow management, cash-flow management and risk management.

2.2 Retail Pharmacies Service Chain

As the focus of this research is on retail pharmacy chain, then it can be described as *a product service supply chain* according to Wang et al. (2015) description earlier as it combines physical products (mainly medicines) and services (medical services). According to Parmata et al. (2016), the pharmaceutical industry is one of the fastest growing industries and it plays a crucial role in sustaining people's health. They further added that managing the logistics and supply chain of the pharmaceutical industry is of prime importance because logistics costs could be up to 55 percent. They also stated that the cost of a one-day delay for medicines to reach the market could cost companies one million USD.

The main purpose of the pharmaceutical supply chain is to deliver the required medicines to patients. The pharmaceutical supply chain involves manufacturing companies, distributors and retail pharmacies either as units in medical facilities or retail chains. The dynamics of the pharmaceutical supply chain differ from one country to another according to local regulations and market characteristics. However, the supply chain practices and the quality of service provided in this chain, remained a top priority. Therefore, the literature showed some research on supply chain and the concept of quality in SSC of pharmaceutical companies and retail pharmacies.

Shah (2004) studied the optimization of the pharmaceutical supply chain, focusing on facility location, production planning and detailed scheduling. Jarrett (2006) examined the implementation of just-in-time (JIT) in the healthcare logistics system to recommend operational improvements. Pazirandeh (2011) developed a model to strategically source vaccines and medicines to developing countries through the identification of strategic criteria used in making sourcing decisions. Parmata et al. (2016) addressed the issue of perceived quality in the manufacturer-distributor interface in the pharmaceutical supply chain through a proposed measurement adapted from SERVQUAL. Moving downstream of the pharmaceutical supply chain, Devi et al. (2016) examined the retail-client interface by identifying the critical factors that define the quality of service provided and its impact on customer satisfaction. It was noted however that there is a gap in the literature examining the retail pharmacy supply chain practices and Rojas et al. (2018) also noted that there is a lack of research that evaluated the service offered by pharmacies.

2.3 Supply Chain Maturity Assessment Test

The concept of maturity models was developed to assist organizations in benchmarking the maturity/development of their operations relative to best practice. According to Fraser et al. (2002), many maturity models were designed for different purposes such as quality management, product development, supplier relationships, innovation and supply chain management. As for supply chain management, only few models were developed, validated and tested in several studies. Using the Supply Chain Operations Reference model (SCOR), Lockamy and McCormack (2004a; 2004b) developed a 'supply chain management process maturity model' which describes a supply chain's business process maturity i.e. the degree of process integration in the supply chain. Srai and Gregory (2005) designed the 'supply chain capability map' which assesses the maturity of supply chain capabilities based on the resource-based view. Alfnes et al. (2006) proposed the 'operations excellence audit scheme' which evaluates operations based on fifteen lean best practices.

The most widely used maturity model in supply chain management is the supply chain maturity assessment test (SCMAT) which was developed by Netland et al. (2007). As shown in Table 2, this model addresses 48 best practices classified into seven categories in which

organizations should evaluate their maturity level: strategy, control, processes, resources, materials, information and organization.

Table 2. Supply Chain Maturity Assessment Test SCMAT

SCMAT	#	Best Practice	Definition
Strategy	1	Supply chain (SC) strategy	A clearly stated SC strategy exists
	2	Customer focus	The strategy is customer focused.
	3	Aligned strategy	The SC strategy is aligned with each company's strategy, vision & mission
	4	Aligned collaboration	The degree of collaboration in the SC is based on analysis of the importance of product, availability of product and degree of customization
	5	Aligned incentives	SC partners share risk, costs and rewards when improving SC performance
	6	Concurrent engineering	Processes, components and products are redesigned in collaboration with suppliers and customers.
	7	Aligned roles	Roles and responsibilities of each actor are distributed to optimize performance and avoid conflict in the SC.
	8	Corporate Social Responsibility and Health Security and Environment	HSE & CSR issues are focused, i.e. the company strive to understand and respond to the expectations of all stakeholders in society.
Control	9	Mass customization	The SC has a strategic use of customer decoupling-point where products are designed for postponement and mass-customization
	10	Supply chain coordination	Planning, forecasting and replenishment are coordinated in the SC
	11	Shop-Floor Top-Floor	Local control and management of production sites are integrated in the SC's global control and management
	12	Aligned Performance Management System	The PMS translates SC strategy into objectives, metrics, initiatives, and tasks customised to each group and individual in the SC
	13	Balanced KPIs	KPIs address financial and non-financial perspectives, internal and external perspectives, and short-time and long-time perspectives
	14	Aligned KPIs	KPIs are automatically measured and reported in same format through-out the supply chain
	15	Risk Awareness	Risk awareness (risk indicators, contracts, alternative suppliers or transporters etc) is an integrated part of SC management
	16	Resiliency	Contingency plans for supply chain events exist
	17	Control model	The SC has a holistic and visual representation (control model) of how production/logistics processes are conducted
	18	Ordering seamlessness	There is a seamless ordering process from customer request to delivery of product
	19	Procurement seamlessness	There is a seamless procurement process through integrated manufacturing and supplier relationships
	20	Planning seamlessness	There is a seamless planning processes performed by dedicated SC teams representing a cross-division of the SC

Processes	21	Customer diversification	Key customer groups are continuously re-defined, profit-monitored and diversified according to product and service-level
	22	Standardized processes	Processes are standardised to enable plug and play connectivity between SC actors
	23	Continuous improvement	Continuous and incremental improvement is focused and gives tangible results
Resources	24	Technology leadership	The SC is continuously seeking and implementing leading production technology
	25	Core competence	The supply chain has a strong focus on core competences
	26	Utilisation of tangibles	The SC highly utilize vehicles, inventories and facilities
	27	Minimized waste	The SC has a high utilisation of personnel where waste is minimised
	28	Agility	The SC can manage an unexpected large increase in demand (> +20%) and deliver within agreed short-time delivery conditions
Materials	29	Material flow	The flow of materials in the SC is directed and well defined
	30	Optimized distribution	Distribution is optimised through route planning, cross-docking etc.
	31	Synchronized deliveries	Delivery of products and/or complementary services from different actors in the SC is synchronized to fulfil customer needs
	32	Modularized products	Products are modularised to improve flexibility
	33	Minimized inventories	Inventories are minimised
	34	Buffer stocks	An inventory of key product components is kept to prevent manufacturing delays
	35	Mass production lines	Different supply chains are created for different product lines to optimise capabilities for each product line
Information	36	ICT strategy	A supply chain ICT strategy is clearly stated
	37	Information dashboards	Information is collected, processed, visualised and presented in a centralised decision point (dashboard), to enable efficient decision making
	38	Information visualization	Information is visualised in all processes, both value-adding and administrative
	39	Supply chain transparency	A system is implemented that provides all actors equal access to forecasts, inventory status, point-of-sales data and plans
	40	Real time information	Data capturing technologies and IT-systems facilitates decisions based on data and information that are in real-time
	41	Track & trace technologies	Bar codes, sensors and/or RFID are used for track and trace functionality throughout all SC processes.
	42	ICT integration	All SC actors' ICT systems are integrated
	43	Virtual networks	ICT systems have modular standardised interfaces to provide connectivity between actors in the network
	44	Supply chain teams	Cross functional and inter-organisational teams are established to improve SC performance
	45	Flexible labour	SC actors have flexible and empowered labour force trained to carry out different processes

Organization	46	Knowledge level	The SC actors have knowledge about advanced SC management tools and best practices
	47	Best-in-class people	Best-in-class people possess the key positions for SC management
	48	Fellow Feeling	There exist a healthy organisation culture supporting the overall SC strategy

The SCMAT is an easy qualitative assessment tool that uses a 5 point maturity scale where organizations can evaluate their operations by asking the question 'to which extent does our firm use best practice?' and select the appropriate answer as follows: '1' never or does not exist, '2' sometimes or to some extent, '3' frequently or partly exist, '4' mostly or often exist and '5' always or definitely exist. Consequently, this assessment would show the degree of the supply chain activities maturity at the strategic and operational level and would define the areas that need improvement in the organization's supply chain. The review of literature showed that the SCMAT was not previously used in the pharmaceutical supply chain nevertheless in the retail-consumer interface. Therefore, this study would use the SCMAT to assess the maturity of a retail pharmacy chain in Egypt with the aim of highlighting its current status in supply chain practices and emphasizing the areas for possible improvements.

3. RESEARCH METHODOLOGY

This research is qualitative and descriptive in nature as it follows the case study approach to enable the researcher to conduct an in-depth analysis of the supply chain activities assessment. According to Yin (2003) the case study approach assists researchers to thoroughly analyze a phenomenon. The retail pharmacy sector is highly fragmented in Egypt and only a few chains dominate the retail pharmacy sector. The researcher selected one of the top three retail pharmacy chains in Egypt. For confidentiality reasons, the name of the chain would not be published. The basis of selection was upon the number of retail stores and geographic coverage. This chain operates in the Egyptian market since 1975 and now operates in eight cities with a total of 85 retail stores. To examine the supply chain maturity of this retail pharmacy chain, a focus group was organized with eleven top and middle managers belonging to the following functions: supply chain, logistics, quality management, operations, information technology, customer service, procurement and human resources. The focus group was used as a data collection tool because it allows the researcher to get in-depth details on the views of participants concerning the points discussed. In this focus group, participants assessed the level of supply chain maturity of their company using SCMAT and discussed the maturity status of each of the seven categories included in the SCMAT.

4. RESEARCH FINDINGS

The focus group started by asking the participants to give an overview of the pharmaceutical market in Egypt. The participants stated that Egypt is the largest producer and consumer of pharmaceutical products in the Middle East with a market value close to 2 billion USD. The prices of medicines in Egypt are decided by the Ministry of Health and Population through a forced pricing mechanism since the 1950's with various amendments along the years. The latest amendment done rearranged the distribution of profit margins to the parties involved: manufacturers, distributors and retail pharmacies. This in return requires pharmacies to be highly efficient to reduce cost and maintain their profit margins. In order to sustain its business in the Egyptian market, retail pharmacies sell a variety of products: prescription medicines, over the

counter (OTC) medicines, personal care products and accessories, cosmetics and medical accessories.

To assess the maturity of the retail pharmacy chain, each best practice in the seven categories was discussed and the participants agreed on the score given to each practice as shown in Table 3. The first category 'Strategy' included eight practices in which the participants rated the maturity level between frequently or partly exist to always exist. The most applied practices in this category were "customer focus", "concurrent engineering" and "HSE & CSR" practices. The participants emphasized that customer satisfaction is a top priority in the pharmaceutical business and it is achieved by ensuring that patients/customers get the medicines when and where required. As the operation manager stated, "the medicines business is crucial to humans' lives, so we cannot accept less than 100% level of customer service". Moreover, they stated that the company ensures that there are different alternatives available for the treatment requested to suit the varied purchasing power of Egyptian patients especially as it differs from one city to another. Thus, the company ensures that there is aligned collaboration with the supply chain partners namely the distributors and manufacturers. A key practice that was rated as 'partly exist' is the 'supply chain strategy'. The participants stated that the company does not have a clearly stated supply chain strategy, but as mentioned previously it is the high level of customer service which drives operations between all the partners involved.

Table 3. Supply Chain Maturity Assessment Test of the Retail Pharmacy Chain

SCMAT	#	Best Practice	Score
Strategy	1	Supply chain strategy	3
	2	Customer focus	5
	3	Aligned strategy	3
	4	Aligned collaboration	4
	5	Aligned incentives	3
	6	Concurrent engineering	5
	7	Aligned roles	4
	8	HSE & CSR	5
Control	9	Mass customization	4
	10	Supply chain coordination	3
	11	Shop-Floor Top-Floor	3
	12	Aligned PMS	4
	13	Balanced KPIs	3
	14	Aligned KPIs	3
	15	Risk Awareness	4
	16	Resiliency	4
	17	Control model	3
Processes	18	Ordering seamlessness	5
	19	Procurement seamlessness	5
	20	Planning seamlessness	4
	21	Customer diversification	5
	22	Standardized processes	4
	23	Continuous improvement	4
Resources	24	Technology leadership	3
	25	Core competence focus	4
	26	Utilisation of tangibles	5

	27	Minimized waste	4
	28	Agility	4
Materials	29	Material flow	4
	30	Optimized distribution	3
	31	Synchronized deliveries	4
	32	Modularized products	3
	33	Minimized inventories	3
	34	Buffer stocks	5
	35	Mass production lines	4
Information	36	ICT strategy	2
	37	Information dashboards	4
	38	Information visualization	4
	39	Supply chain transparency	5
	40	Real time information	5
	41	Track & trace technologies	5
	42	ICT integration	2
	43	Virtual networks	2
Organization	44	Supply chain teams	2
	45	Flexible labour	3
	46	Knowledge level	3
	47	Best-in-class people	3
	48	Fellow Feeling	3

The second category 'Control' included nine practices presenting the tools implemented to control and monitor supply chain operations. Participants rated the maturity level of these practices either often or partly exist. The practice of 'supply chain coordination' is implemented to plan, forecast and replenish medicines in the retail network but still the full coordination with all distributors does not exist which affect lead time in some locations. One key remark about KPIs in the 'Control' category was the lack of integration as the participants clearly stated that KPIs are highly functional and are not clearly related to the supply chain performance. Some examples of the financial KPIs used are gross profit margin, sales, return on investment and sales to asset. Consequently, expenses are highly monitored as they directly affect profitability levels. Moreover, it was stated that cash flow management is of prime importance to the continuity of the retail pharmacy business in terms of growth and operations. To monitor/control cash flow, the company uses inventory turnover days, prescription inventory turnover days, accounts receivable collection days, and accounts payable turnover days. However, no logistics KPIs was mentioned such as delivery time, order fill rate, etc. As for the practice of 'mass customization', the participants explained that apart from selling manufactured medicines to the public, they also specially make their own syrups or ointments in their laboratories to fill some gaps that might exist for certain medical conditions or for sale in specific seasons like winter. For 'risk awareness' and 'resiliency' the company has alternative plans and alternative suppliers/transporters in case of sudden demand or unforeseen market conditions.

The third category 'Processes' is managed through a well-defined quality system in which all the processes of the retail chain are documented and known to all the staff members involved. The company implements an information system to receive customers' orders, follow up deliveries, to keep track of the stock levels in stores and to initiate purchase orders to distributors. This information system also allows the company to analyze the customers'/patients' profiles, to determine the profitable segments and to design special offers for each. As for 'continuous

improvement' the company prides itself that it has its own training academy to continuously develop its staff members with customized training to ensure that they are knowledgeable about the latest trends in the pharmaceutical sector as well as in marketing and customer satisfaction.

The fourth category 'Resources' focus on the utilization of assets, technology, waste reduction and agility. As mentioned earlier, pharmacies follow an efficient approach in operations to control expenses which if not controlled, it will negatively affect the 'already slim' profit margins. Therefore, the company ensures that all the assets in the retail network i.e. warehouses, stores and trucks are efficiently utilized. Stores for instance are ideally located in highly populated areas, can be accessed by different means of transport and provides large geographical coverage. As the chain targets a 100% customer service level, their logistics network is carefully planned to preserve the ideal conditions of the products/medicines sold through the temperature-controlled storage system and trucks. The company has its own fleet of pick-ups and small sized trucks and does not outsource the transportation function to an outside company to ensure that its products are transported in the right condition. According to one of the participants, the core competence of their chain is 'reliability'. They clarified that the 100% customer service level won't be achieved if the chain was not reliable i.e. yielding consistent performance in product/medicine availability 24/7.

The fifth category 'Materials' targets the inventory management of medicines/products and their flows across the chain. One of the participants emphasized that inventory management is highly important to their success in the market and it targets the reduction of procurement and carrying costs and at the same time balancing stock levels at the retail stores. Another participant added that the lack of a sound inventory management system in pharmacies can have an adverse effect on the reputation of the retail pharmacy chain in case of spoiled products, expired or counterfeit medicines or simply the unavailability of highly demanded products. Thus, stock reviews are done through the information system to monitor the stock levels weekly and check the expiry dates monthly. In terms of distribution, a centralized operation office plans and executes the distribution activities daily from the warehouses to the retail stores to prevent stock-outs. In some cases, inventories are moved from one store to others due to unexpected increase in demand especially in the winter season. Stock deliveries are normally done early morning before rush hours.

The sixth category 'Information' focuses on the application of information technology to manage the supply chain activities. As mentioned previously, the company has an information system through which it collects and processes information that support decision making for top management. However, this information system is not integrated with their suppliers (distributors) as this practice is not common in the Egyptian market yet. Therefore, real-time data on sales and stockouts are not shared with partners. All the retail stores are connected through a network that allows stores to check inventories at various locations and fulfilling demands from the nearest points to customers. The barcoding system is currently used to identify products and monitor its movements and currently there are no plans to change or adopt new track and trace technologies such as sensors and RFIDs.

The seventh and last category 'Organization' is concerned with human resources in logistics and supply chain. The maturity level of the practices in this category are less than its counterparts in other categories. The participants stated that the internal cross functional team is formulated as a reactive action to a specific situation. As explained by one of the participants "sometimes we have a problem in sales in some locations and we know that the pharmacies' business is also a retail business which requires sometimes innovative approaches to attract customers, so at this point it is important to call for a cross functional team". According to the

participants, cross functional teams were not formed before between supply chain partners to solve logistics or supply chain issues. In terms of 'flexible labor' and 'knowledge level' it was stated that these two practices still need a lot of development as the majority of the staff involved in logistics operations perform day-to-day activities and do not have the comprehensive scope of understanding the impact of logistics/supply chain decisions on the performance of the company. Finding the 'best in class' supply chain calibers is a challenge not only in the pharmaceutical business but in the Egyptian market as a whole. The participants stated that in Egypt we have a huge lack of qualified calibers who understand the dynamics of logistics and supply chain operations.

5. CONCLUSIONS AND FURTHER RESEARCH

The management of the SSC is vital to the success and competitiveness of service organizations. Through this research, the literature revealed that SSC was studied by various researchers over the years, and different methods were developed to measure its performance. But there was a gap in research addressing SSC maturity in general and in the retail pharmacy business in specific. The case study assessed the maturity level of supply chain management in one of the top retail pharmacy chains in Egypt. The assessment revealed that most of the best practices are implemented at a moderate level and significant improvements can be made. Identifying a clear supply chain strategy is a priority that would drive the implementation of the best practices in all the different categories studied. It was clear that the company did not fully exploit their supply chain capabilities which can support them in expanding their operations to more cities in Egypt. Recruiting best in class supply chain calibers is also a priority as they will be responsible for designing a supply chain strategy that can optimize resources and achieve the company's goals.

Further research can address a wide range of topics as there is a significant gap in literature that addresses logistics/supply chain operations in the pharmaceutical sector in Egypt and the Middle East. Potential research can focus on identifying KPIs to be implemented in the SSC for the retail pharmacy chains, examining the best inventory management practices and managing the distribution/logistics networks of retail pharmacy chains.

6. REFERENCES

Alfnes, E., Dreyer, H., Strandhagen, J.O. (2006). The Operations Excellence audit sheet, *Proceedings of the IFIP WG 5.7 Conference*, Wrocklav, Poland.

Arnold, J.M., Javorcik, B.S. and Mattoo, A. (2011). Does services liberalization benefit manufacturing firms? Evidence from the Czech Republic. *Journal of International Economics* 85 (1), 136-146.

Baltacioglu, T., Ada, E., Kaplan, M. D., Yurt, O. and Kaplan, Y. C. (2007). A new framework for service supply chains. *The Service Industries Journal* 27 (2) 105-24.

Chopra, S. and Meindle, P. (2013). *Supply Chain Management: Strategy, Planning, and Operation*, 5th Edition, Prentice-Hall, Upper Saddle River, NJ.

Devi, P.U.M., Rao, B.S., Shekhar, B.R. and Bhaskar, N.U. (2016). Service quality in pharmaceutical supply chain-a study with reference to three major cities of Andhra Pradesh, India. *International Journal of Services and Operations Management* 24 (4) 433-458.

Ellram, L. M., Tate, W. L. and Billington, C. (2007). Understanding and Managing the Services Supply Chain. *Journal of Supply Chain Management* 40 (4) 17-32.

Fraser, P., Moultrie, J. and Gregory, M. (2002). The use of maturity models/grids as a tool in assessing product development capability, *Proceedings of the IEEE International Engineering Management Conference*, 1, 244–249.

Jarrett, P.G. (2006). An analysis of international health care logistics: the benefits and implications of implementing just-in-time systems in the health care industry. *Leadership in Health Services* 19 (1) 1-10.

Liu, W. (2007). *Research on the coordination of capacity cooperation in logistics service supply chain*. Doctor dissertation of Shanghai Jiaotong University, Shanghai.

Lockamy, A. and McCormack, K. (2004a). The development of a supply chain management process maturity model using the concepts of business process orientation. *Supply Chain Management: An International Journal* 9 (4) 272-278.

Lockamy, A. and McCormack, K. (2004b). Linking SCOR planning practices to supply chain performance: An exploratory study. *International Journal of Operations & Production Management* 24 (11/12) 1192-1213.

Netland, T. H., Alfnes, E., Fauske, H. (2007). How mature is your supply chain? A supply chain maturity assessment test, *Proceedings of the 14th International EurOMA Conference Managing Operations in an Expanding Europe (EurOMA 2007)*, Ankara, Turkey.

Parmata, U., Rao B, S. and B, Rajashekhar (2016). Measuring service quality in pharmaceutical supply chain distributors perspective. *International Journal of Pharmaceutical and Healthcare Marketing* 10 (3) 258-284.

Pazirandeh, A. (2011). Sourcing in global health supply chains for developing countries: literature review and a decision-making framework. *International Journal of Physical Distribution and Logistics Management* 41 (4) 364-384.

Rezaei Pandari, A. and Azar, A. (2017). A fuzzy cognitive mapping model for service supply chains performance. *Measuring Business Excellence* 21 (4) 388-404.

Rojas, Fernando, Coluccio, Giulani and Vega, Juan (2018). Relationships between supply performance of pharmacies in Chile and their quality of customer service. *International Journal of Pharmaceutical and Healthcare Marketing* 12 (4), 433-446.

Shah, N. (2004). Pharmaceutical supply chains: key issues and strategies for optimization. *Computers and Chemical Engineering* 28, 929-941.

Srai, J. S., and Gregory, M. J. (2005). *Supply chain capability assessment of global operations*.

Wang, Y., Wallace, S.W., Shen, B. and Choi, T.M. (2015). Service supply chain management: a review of operational models. *European Journal of Operational Research* 247 (3), 685-698.

Yin, R.K. (2003). *Case Study Research: Design and Methods*, 3rd Edition. Sage Publications, Thousand Oaks, CA.

Zailani, S. H. M., and Kumar, K. M. (2011). Service supply chain (SSC): proposed SSC practices measurement items for empirical testing. *Journal of System and Management Sciences* 1 (5), 11-18.

Zhang, Ruoqing and Chen, Haiquan (2015). A Review of Service Supply Chain and Future Prospects. *Journal of Service Science and Management* 8, 485-495.