Industrial Engineering Letters
ISSN 2224-6096 (Paper) ISSN 2225-0581 (online)
Vol.3, No.1, 2013

The role of Supply Chain Applications in Jordanian Pharmacies: A case study on Pharmacies in the capital city Amman

Loay Alnaji[1*] Mahmood Ridha[2]

1. Department of Business Administration, Al-Zaytoonah University of Jordan/Amman 11733, Jordan
2. Department of Business Administration, Al-Zaytoonah University of Jordan/Amman 11733, Jordan

* E-mail of the corresponding author: Loay@Alnaji.net

Abstract

This paper explores the role of Supply Chain Management applications in the pharmaceutical world as well as its effect and uses in local pharmacies. Most pharmacies in the studied group rely heavily on manual labour rather than computerized systems, risking medicine interruption on a frequent basis. Furthermore, those who use a computerized system do not believe it helps them reduce medicine interruptions either because the system is too complicated to use or does not meet the pharmacy's demands. To measure the effect and role of supply chain management applications a questionnaire was built and evaluated by peers. The research builds on data collected from pharmacies in Amman, the capital city of Jordan. The study sheds light on the importance of using Supply Chain Management applications to support and maintain a fixed supply of medicine. The study also focuses on some difficulties pharmacists face preventing them from using such tools. The research provides several suggestions on improving the supply chain applications used by pharmaceutical companies in Amman by focusing on the needs of the pharmacists as well as using the proper tools (both hardware and software). The research also provides several suggestions on how to improve the supply chain management model used by both pharmacies as well as suppliers to reduce medicine interruptions.

Keywords: Supply Chain Management, technology, medicine interruptions, SCM life cycle

1. Introduction

As competition increases in the global market, companies are starting to find it more difficult to meet its customer demands. Pharmacies are in constant challenge to avoid any medication interruption, risking losing customers. The paper explores the different aspects leading to medicine interruption in pharmacies in the Jordan/Amman. The study explores the tools used by pharmacists to keep track of medicines, reduce interruptions, and stay competitive. The study also sheds some light on the local applications pharmacists use and their effect on business.

2. Definition

There are many different definitions for Supply Chain Management (SCM). Wong and Boon-itt (2008) defined it as internal as well as external processes companies perform to work together in a cooperative manner. Sousa, Liu, Papageorgiou, and Shah (2011) defined SCM as an integrated process in which several business entities work together to produce goods and services. Even when authors define SCM differently, they agree that the supply-chain model is not a fixed system; it is a complicated, continuously growing system that requires maintenance throughout its different cycles. Wong and Boon-itt addressed SCM as a system consisting of several parts, mainly an internal-integration system, defined as the process of interdepartmental interaction and interdepartmental collaboration, bringing departments together into a cohesive organization, and a supplier-integration system "used to facilitate the process of interaction and collaboration between an organization with its suppliers to ensure an effective flow of supplies" (Wong & Boon-itt, 2008).

Cohen and Lee (1988), in contrast described SCM as a modeling chain composed of vendors, plants, distribution centers, warehouses, and customer areas.(Sousa et al., 2011). Hagelaar and van der Vorst (2001) defined SCM not as a simple chain of businesses with one-to-one, or business-to-business relationships, but as a network of multiple businesses and multiple relationships. Other researchers defined SCM based on its use or the benefits reaped from using it. Beers, Beulens, and van Dalen, 1998 defined it as "organizations that commit themselves, based on expectations of consumers, stakeholders and physical dependencies," whereas Cooper, Lambert, and Pagh, 1997 defined SCM as more of a set of processes linking consumers to the original suppliers leading to product-service information. Regardless of the differences in defining SCM, all definitions share the concept of SCM as facilitating

the flow of product from the vendor to the customer with minimal interruption, managing the relationships between different vendors, and managing vendor/customer relationships.

3. Why Use an SCM Model?

Due to globalization and increased competition, companies are forced to reduce product life cycle by tightening shipment dates and providing quick delivery of their goods and services to their customers. Furthermore, as companies get larger and expand over states and countries, it is becoming more and more important to implement a strong SCM model to ensure that the product flow continues without interruption. The literature describes many different frameworks to measure performance of SCM models (Verdecho, Alfaro-Saiz, Rodriguez-Rodriguez, & Ortiz-Bas, 2012). Furthermore, collaboration between different branches and companies to improve management, productivity, and even trust through information sharing has also become a priority to many organizations (Verdecho et al., 2012).

Another factor pushing companies to implement and maintain a strong SCM model is competition (Gunasekaran & Ngai, 2005). To compete in the market, companies had to move to a more centralized structure. By doing so, they were able to be closer to their customers, as well as offer their services or products for lower prices, giving them an advantage over other organizations (Gunasekaran & Ngai, 2005). Furthermore, supply chain management applications can be used as a decision support systems to minimize the risk of using personality criterion in determination of order size (Ridha, 2012). On the other hand, supply chain management systems can be used as a decision support system to minimize the risk of using personality criterion in determination of order size (Mahmood, 2012). On a larger scale, countries, such as Jordan, realized the importance of SCM models to improve the relationship between itself and its citizens as well as create a ripe environment for foreign-company investments (Shwawreh, 2006). Realizing this, the government pushed for the implementation of SCM models in most facets of life (Shwawreh, 2006).

4. Examples of companies using SCM

The literature is filled with examples of companies, even countries, leading the market, due to implementing SCM models. China, for example, depends on supply-chain systems to help strengthen its environmental regulations, as well as to deal with complex problems that require complex solutions. Dell, one of the leading computer-hardware companies in the United States depended heavily on a Build To Order Supply Chain to provide its customer base with the latest hardware (technology as well as minimizing inventory costs; Verdecho et al., 2012). Furthermore, there are environmental benefits to using SCM. Recently, much attention has been directed toward environmental SCM, Some companies in China started building sustainable supply chain models (S-SC) due to the strengthening of environmental regulations. Such models aid companies deal with multi-criteria decision-making problems that can affect both the organization as well as the environment (Jian, Xuhong, Yu, & Yiner, 2011). In its aim to improve the country's economy, and due to its geographic location, the Jordanian government focused on implementing different SCM models in its industrial sector (Shwawreh, 2006).

5. Theoretical framework

A detailed research covering the literature of Supply Chain Management Applications was conducted. Because the SCM models go through different life cycles involving production, marketing, packaging, and reverse logistics where company's interest differs depending on the phase of the SCM (Jian, Xuhong, Yu, & Yiner, 2011), this research focuses on the final phase, implementation.

5.1. Study Variables

The study sample consisted of 50 pharmacy employees. The sample is currently employed in at least one pharmacy. The sample was given 50 questionnaires; 33 were recovered from which none were rejected for errors. The final total of questionnaires in the study was 33, a total of 66% of the study population.

5.2. Tools

To achieve the objectives of the study a questionnaire was designed. To ensure the questionnaire meets the research requirements and focused on our objectives, it was evaluated by five experienced employees working in the same field. Their recommendations to modify certain aspects of the questionnaire were followed and implemented. The tool used for this research was a questionnaire consisting of 18 questions. The questionnaire was divided into two sections: the first focused on the demographics of the sample; the second focused on supply-chain applications including medicine outages, and the type of order/track delivery system used. Study Constraints

1. The study focuses on one region, Jordan's capital, Amman.
2. The research sample represents 25% of the total study population in West Amman.
3. Study focused on medicine shortages at the pharmacy level rather than at the distributer level.

6. Study Results

Table 1. Demographic information of survey respondents

Measure	Items	Frequency	Percentage
Pharmacy owner/pharmacist in charge	Male	15	45
	Female	18	55
Age	30 years or less	13	39
	31–40	13	39
	41–50	5	15
	Over 50 years	2	6
Date of certification	5 years or earlier	13	39
	6–10 years	6	18
	11–15 years	8	24
	Over 15 years ago	6	6
Country certificated earned at	Jordan	20	61
	Arabian Country	5	15
	Western Europe	1	3
	East Europe	2	6
	America/Canada	1	3
	Australia and New Zealand	0	0
	Other	4	12
Age of pharmacy you're working at	5 years or less	14	42
	6–10 years	7	21
	11–15 years	8	24
	15 years or older	4	12
Total years in practice	5 years or less	17	52
	6–10 years	4	12
	11–15 years	8	24
	15 years or older	4	8

Table 1 shows that 39% of the search sample is of age less than 30 years old, furthermore, 61% received a graduate degree in the past five years or more, 61% of them received their degree from a Jordanian university while the rest from abroad . Furthermore it indicate that 52% had 5 years or less in practice and this means low experience in comparison with 8% had 15 years or older in practice.

Table 2. Classification of Drugs

Measure	Items	Frequency	Percentage
Is the classification of drugs according to a given criterion?	Yes	31	94
	No	2	6
If above answer is yes what is the used measurement to classify drugs?	By warehouse	19	62
	Alphabetized (A–Z)	10	32
	Illness type	1	3
	Manufacturer	0	0
	Other	1	3
Do you believe that the criterion used supports surveillance and drug control levels?	Yes	25	87
	No	6	19

As can be seen in table 2, 94% of the sample examined uses some kind of drug classification technique, 62% depend on the warehouse to processes drugs classification and 32% use the alphabet system for classification. 87% of the sample confirmed that the classification technique used help support control medication exchange in other side 19% believe that the criterion do not support surveillance and drug control.

Table 3. Medicine Outages

Measure	Items	Frequency	Percentage
Do you have outages in drug supply?	Yes	30	91
	No	3	9
If yes, how many times does it happen?	Weekly	7	25
	Monthly	13	46
	Every 3 months	4	14
	Every 6 months	3	11
	Other	1	4

As can be seen in table 3, 91% of the sample examined confirms the existence of interruption in deliveries of medicine, 25% state that interruptions happen on a weekly basis while 46% state that it happens on a monthly basis.

Table 4. Reasons for Irregular Supply of Medicines and Outages

Measure	Items	Frequency	Percentage
What are, in your opinion, the reasons for irregular supply of medicines and outages?	External supplier	10	33
	Internal supplier	23	77
	No stock or low stock in the pharmacy	3	10
	Failure to accurately assess the demand by pharmaceutical management	5	17
	Failure to follow up with prescriptions	2	7
	Other	1	3

Table 4 shows that 77% of the sample examined blames the interruption in drug support on failure of internal tracking systems while 33% blame the external supplier. Furthermore it indicates that 17% blames the pharmaceutical management in failure to accurately assess the demand of drugs.

Table 5. Means of Determining Order Quantity

Measure	Items	Frequency	Percentage
What are the means used to determine the size of orders?	Personal experience	10	30
	Formulas	5	15
	Hit/miss	1	3
	Based on offers given by the supplier	6	18
	Based on prescriptions	23	70
	Others	3	3

Table 5 shows that the prescriptions is the main tool in determination of order quantity by percentage 70% in other hand explains that the experience plays a big role in determining the amount of medicine ordered and in reducing the supply interruptions by percentage 30%, furthermore the table explain that 15% used quantitative methods .These results indicate the weakness of using the quantitative methods in comparison with personal experience.

Table 6. Order/Track/Delivery System

Measure	Items	Frequency	Percentage
Is there a system to monitor orders at your pharmacy?	Yes	26	79
	No	7	21
If the answer is yes, what is the system?	Manual	13	50
	Computerized	13	50
If computerized systems are used, what type of software is used:	Software developed by pharmacists	0	0
	Software developed locally	9	69
	Commercially available software	4	31
Do you believe the system used to support pharmacy imports is too complicated?	Yes	22	67
	No	11	33
If the answer is no, is this because of:	System inadequacy	4	36.5
	Inability to use the system properly by employees	4	36.5
	System is not user friendly	2	18
	Other	1	9

From Table 6 the following can be concluded:

- 21% of the sample examined does not use any kind of SCM system as a control
- 50% use a manual system to keep track of inventory
- 33% believe that the system is not supporting the deliveries of medicine
- 73% blame inefficient use of the system due to its inadequacy. The system used is a commercially available system that does not meet the needs of the worker.

7. Discussion

In conclusion, the pharmaceutical SCM system in the studied sample suffers from extensive medicine interruptions in pharmacies (based on 91% of the studied sample). This is due to the fact that 50% use manual labor to track medicine supplies, and 30% depend on worker experience to fill the orders and predict which medicine sells faster than the other. Furthermore, the small percentage of pharmacists that use a computerized SCM system blame the medicine interruptions on software inadequacies, mostly because the software is built not to support the workers needs, but simply to support pharmacies in general, even though 69% of the applications used were internally developed!

8. Recommendations

The use of supply chain management systems is becoming more important as countries get into global competition. More and more organizations, especially pharmacies, are starting to feel the pressure of competition and the effect running out of medicine has on its customers.

In light of the above findings, it's recommended that further research on the different tools and technologies be conducted to aid in clarifying some of the applications that can help reduce medicine interruptions in pharmacies, as well as meet pharmacists' demands. Furthermore, a study that explores the role of suppliers and the systems they use should be conducted to explore the reasons why suppliers themselves run out of medicines, do these interruptions occur worldwide? Are they linked to any factor such as the country's economy or political system? A look at the current SCM applications, especially local applications built to support the local pharmacist, is needed, to determine the reason behind not relying on the proper software to reduce medicine interruptions. Finally, it's important to explore quantitative methods as well as the role of intellectual capital in pharmacies and its role in running the

business, according to (Najim, Mohamed, & Alnaji, 2012) such knowledge can generate value to the business and might be another factor, together with reducing medicine interruptions, to improve businesses.

References

Beers, G., Beulens, A. J. M., & van Dalen, J. C. (1998). Chain science as an emerging discipline. In G. W.

Cohen, M.A., Lee, H.L., 1988. Strategic analysis of integrated production-distribution systems – models and methods. Oper. Res. 36, 216–228.

Cooper, M.C., D.M. Lambert and J.D. Pagh (1997). ‗Supply Chain Management: more than a new name for logistics. International journal of logistics management', 8 (1), pp. 1-13.

Gunasekaran, A., & Ngai, E. W. T. (2005). Build-to-order supply chain management: A literature review and framework for development. *Journal of Operations Management, 23,* 423–451.

Hagelaar, G. J. L. F., & van der Vorst, J. G. A. J. (2001). Environmental supply chain management: Using life cycle assessment to structure supply chains. The *International Food and Agribusiness Management Review, 4,* 399–412

Jian, C., Xuhong, Y., Yu, Q., & Yiner, L. (2011). An integrative decision-making model for the operation of sustainable supply chain in China. *Energy Procedia, 5,* 1497–1501.

Najim A., Mohamed A., & Alnaji (2012). Impact of Intellectual Capital on Realizing University Goals in a Sample of Jordanian Universities. European Journal of Business and Management, 4 (14), 153-162.

Ridha B. Mahmood. Linear Programming as a Decision Support System in Knowledge Management Case study : Hospitals in Jordan. 8th International Conference on Networking Computing. Unpublished conference paper, 2012. Korea. Print.

Shwawreh, A. (2006). The importance roles of logistics and electronic services in developing Arab countries' commerce. *Arab Commerce* (p. 36). Doha, Qatar: Ministry of Transportation Jordan.

Sousa, R. T., Liu, S., Papageorgiou, L. G., & Shah, N. (2011). Global supply chain planning for pharmaceuticals. *Chemical Engineering Research and Design, 89,* 2396–2409. doi:10.1016/j.cherd.2011.04.005.

Verdecho, M.-J., Alfaro-Saiz, J.-J., Rodriguez-Rodriguez, R., & Ortiz-Bas, A. (2012). A multi-criteria approach for managing inter-enterprise collaborative relationships. *Omega, 40,* 249–263.

Wong, C. Y., & Boon-itt, S. (2008). The influence of institutional norms and environmental uncertainty on supply chain integration in the Thai automotive industry. *International Journal of Production Economics, 115,* 400–410.

Ziggers, J. H. Trienekens, & P. J. P. Zuurbier (Eds.), Chain management in agribusiness and the food industry (pp. 295-308). Wageningen, The Netherlands: Wageningen University.

Zsidisin, G. A., & Siferd, S. P. (2001). Environmental purchasing: A framework for theory development, *European Journal of Purchasing & Supply Management, 7,* 61–73. doi:10.1016/S0969-7012(00)00007-1.

This academic article was published by The International Institute for Science, Technology and Education (IISTE). The IISTE is a pioneer in the Open Access Publishing service based in the U.S. and Europe. The aim of the institute is Accelerating Global Knowledge Sharing.

More information about the publisher can be found in the IISTE's homepage: http://www.iiste.org

CALL FOR PAPERS

The IISTE is currently hosting more than 30 peer-reviewed academic journals and collaborating with academic institutions around the world. There's no deadline for submission. **Prospective authors of IISTE journals can find the submission instruction on the following page:** http://www.iiste.org/Journals/

The IISTE editorial team promises to the review and publish all the qualified submissions in a **fast** manner. All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Printed version of the journals is also available upon request of readers and authors.

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar