

Evaluating Supply Chain Integration in Health Centers: A Case Study

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Abstract— The main goal of every health center is to provide better service to patients. In order to achieve this objective, Supply Chain management is one of the tools allowing effective management of physical, information and financial flows in order to satisfy patients and improve the performance of these centers. This work aims to measure the impact of SC integration on the performance of health centers. A research model has been designed and tested empirically in a public health center in Algeria. The results show a positive impact of SC integration on the health center's performance. The results also show the importance of investing in the development and improvement of SC practices.

Keywords— SCM, SRM, CRM, Health Center Performance.

I. INTRODUCTION

The issue of health has become one of the most important concerns in the field of development in various societies, whether developed or developing ones. While health represents a value in itself, the provision of quality health care is one of the biggest challenges faced by those in charge of managing hospitals and various health centers since these services are directly related to the health and lives of individuals in the first place, and since the hospital or health center is an intermediary in the provision of health services, it is a haven for patients who seek wellness and healthy people who ask for prevention. Therefore, the issue of providing services becomes a prominent feature in the work of these health institutions. Therefore, it is necessary for the latter to ensure an efficient coordination among all its flows: materials, information, etc., and here emerges the role of Supply Chain Management in the health centers as an approach to enhance hospitals capabilities to achieve full integration for its internal and external process with coordinators.

This study attempts to identify the impact of Supply Chain integration practices on the performance of public health centers in Algeria. Going from this reality, the research issue dealt with in this paper could be crystallized as follows: What is the contribution of the Supply Chain integration to improving the performance of public health centers? In order to answer this question, the main research hypothesis have been developed to examine the positive impact of integration practices (Supplier Relationship Management, internal management of logistics activities, Customer Relationship Management) on improving Health Centers performance (efficiency, effectiveness, flexibility). According to the objectives aimed to be achieved through this study is to get closer to the concept of Supply Chain in Health Centers and its impact on performance, and also to measure the managers' willingness regarding the importance of SC integration.

According to the research methodology: a descriptive analytical method has been used where we dealt with the axis of Supply Chain Management and performance of health centers and the reality of its impact on the through an empirical study at a public health center in Algeria relying on documents and reports provided by the center. The observation research tools as well as interviews with managers have been conducted. Finally, a questionnaire has been elaborated and administrated besides the health center employees to test the impact of Supply Chain Integration on performance.

The issue of supply chain management and its impact on organizational performance has extremely attracted the attention of Researchers and practitioners as well. First: the study of Izabela Dembińska-Cyran (2005), Internal and External Supply Chain of Hospital. This study shows the challenges confronting healthcare executives such as pressures to reduce costs and improve patient quality life. To reach this goal, the organizations are striving to reevaluate their processes to improve the effectiveness of structure and procedures. This study mobilized the SC approach as a strategic tool to redesign the internal and external hospital's process and structure in order to reduce costs and improve quality service. Another study dealt with the SCM in hospitals such as Toba et al. (2008). This latest highlighted the underperformance that hospitals' purchase function can submit once it is not oriented by a global SC vision that allows to get financial gains. The study shows also how a little improvement in SC process could conduct to a bottom line profitability. The study emphasizes the importance of elaborating SC performance indicators to manage the hospital operations. Actually, Kelle et al., (2012) coped with the physical flows, namely the pharmaceutical products and inventory, to improve the hospital performance. as known, a significant part of hospitals costs is due to the purchases of pharmaceutical products as well as their inventory management. This study tested the conflicting aims when taking decisions for the different stakeholders as well as the managerial tradeoff existing in the different organizational levels, namely operational, tactical and strategic level.

Chena et al., (2013) explored empirically the manner of enhancing SC performance through a relational view. To do this, a research model has been developed identifying the factors that influence hospital SC performance such as trust, knowledge-sharing, IT-enabled integration with the hospital's suppliers. The results obtained through the analysis of about 117 SC executives shows a significant positive impact of trust

and IT integration as well as knowledge sharing on Hospital performance. The results also show the mediating role of supplier- hospital integration between Knowledge-sharing and hospital performance. Also, hospital environmental uncertainty has a moderator role between trust and knowledge-sharing and also trust has a moderator role between knowledge-sharing and hospital-supplier integration. In fact, recent studies are dealing more and more with issues related to the use of IT and cloud-computing to improve hospital Supply Chain performance such as the study provided by Kochan et al., (2018). This study highlights the inadequacy of classical information-sharing methods that are characterized by weak visibility related to inventory management, which reflects negatively on patients' care. This study examined cloud computing as an enabler of electronic supply chain management systems (e-SCMs) that enhances collaborative information sharing in a multi-echelon hospital supply chain. Through the mobilizing of systems theory and simulation methods to compare the performance of traditional system and the one based on Cloud computing system, the results show that information sharing based on cloud-computing improves visibility in healthcare SC and allow to achieve reductions in inventory and supply costs and shortages.

II. THEORETICAL BACKGROUND

2.1. Supply Chain Management In Health Centers

- **Supply Chain Management:** The term logistics first appeared in the military field, and with the beginning of World War II, this concept moved to the economic field. The term was defined according to the National Council for the Management of Physical Distribution (Médan & gratacap, 2008, PP. 9-11) in 1972 as “A term describing the integration of two (or more) activities with a view to planning, implementing and controlling the efficient flow of raw materials, semi-manufactured and finished products from the point of origin to the point of consumption.”

The logistics process was also defined as including those services and physical activities related to moving goods, providing the necessary services to support that, and delivering the goods under a comprehensive management of these services as a whole and the various activities that follow (Thabit, 2006, p. 145). In the same line, Supply Chain was defined as a network of Partners interacting together in order to provide the product or service to the final consumer by integrating the flow of raw materials until the delivery of the final product.” As for the term Supply Chain Management (SCM), it appeared for the first time in 1982 (Al-Ali and Al-Kanaani, 2009, p. 34), and it refers to “a process of achieving integration between a group of activities starting with suppliers and ending with the final consumer by providing a mixture of goods, services and information in order to achieve an added value from The point of view of the firm’s clients” (Al-Mustafa and Al-Abd, 2003, p. 125).

- **Health Center Management:** health centers, in their contemporary meanings, have taken various forms and given them various names through different ages. Among the definitions that dealt with this term, we mention the definition of the American Hospital Authority: “A facility, institution, or

place that provides, through a medical or professional body or staff, permanent services (or facilities) that include beds for the admission of patients, medical services, and continuous nursing services, diagnostic and therapeutic for the sick” (Bawana, 2004, p. 143). According to (Landry & Bealieu, 2004, p04) health logistics could be defined as "a set of activities that include design, planning, implementation of purchasing, inventory management and re-supply of goods and services to provide medical services to patients". As for (Dallery, 2004) he divided the flows in hospitals into three types: (1) Material flows that includes the flows of materials and people, which in turn are divided into consumables and non-consumables, as well as the flows of people from employees and patients. (2) Information flows: These include medical decisions, patient files, and organizational decisions. (3) Financial flows: which represent the various costs incurred by the hospital.

2.2. Supply Chain Integration And Health Centers Performance

- **Supplier Relationship Management (SRM):** Supplier Relationship Management is a comprehensive approach to managing an organization's interactions with the companies that supply it with the products and services it uses. Its direct objective is to simplify and activate the supply process between the organization and suppliers, and indirectly aims to improve the quality of information, products, services and workforce capabilities. Managing the relationship with suppliers is similar to managing the relationship with customers, just as the organization needs to develop its relationships with its consumers, it also needs to strengthen its relationships with its suppliers (Metler et Rohner, 2009, p59).

- **Supply Chain Internal Integration (SCII):** Organizations of all types and sizes work as an integrated system to fully coordinate all their internal activities and functions in order to achieve the highest levels of performance at the lowest possible cost. Perhaps the most prominent activities that fall under the logistical function in the health institution are the functions of transportation and warehousing, as the latter are of special importance as they are concerned with assets, the availability of which is one of the challenges faced by these institutions, as well as transportation, whose importance lies in ensuring the complete flow and optimal movement of materials without neglecting the importance of reverse logistics, which represents the flow of these materials in the reverse direction.

- **Customer Relationship Management (CRM):** The customer is the decisive element in building the reputation and prestige of any institution. Therefore, it's worth for any institution that seeks excellence to pay all the attention to how to build a strong and cohesive relationship with customers, which will enable the institution to stand out and make it always at the forefront among its peer institutions. Customer relationship management is an integrated effort to distinguish, maintain or strengthen the relationship with customers and to strengthen this relationship on an ongoing basis, to exchange benefit from all aspects and add value to all collaborators. It is also a comprehensive and practical integrated strategy

between the organization and the beneficiaries in general, and customers in particular, based on dialogue, consultation and mutual trust between them in order to retain customers and achieve value for them. From here, it is clear that the relationship between the institution and the customer goes beyond the limits of the delivery of the good or service to be a relationship of mutual interdependence based on common interests (Al-Taie, pp. 198-197).

- **Health Centers Performance:** According to (Clémence et Hervé, 2007), health performance is related to providing health care to all patients, with the highest level of humanity, at the best prices and providing the best quality of services while keeping pace with the developments in health knowledge. As for (Nobre, 2000), it was found that leading the performance of hospitals requires the inclusion of indicators that allow for internal cooperation (Internal coordination), which allows controlling the various courses of action that involve different actors and different hospital departments in order to provide the best services in light of the financial budget allocated for this while achieving flexibility with the urgent changes in hospitals. In the same context, the World Health Organization, within the framework of the PATH project, presented a set of six (06) basic dimensions of hospital performance: effectiveness, efficiency, human resource orientations, flexibility in management, security, and patient engagement (Chamagne et al., 2005). According to (Bonvoisin, 2011, Blanc et al., 2007), the performance of hospitals must be addressed within the framework of a comprehensive approach. It relates first to socio-economic effectiveness (do the services provided responsive to health needs? Are these services provided in accordance with the specified quality standards?), as well as efficiency (is the provision of health services provided at the lowest possible costs?), as well as the quality of service (the rate of access to healthcare? patient waiting times). It is to note that the performance of hospitals is linked to three basic concepts: efficiency, effectiveness and flexibility with changes.

III. METHODOLOGY

As mentioned above, the Supply Chain integration practices presents an independent variable, and the hospital's performance presents a dependent variable. Figure 1 explain clearly how the effect of the independent variable on the dependent variable as follows:

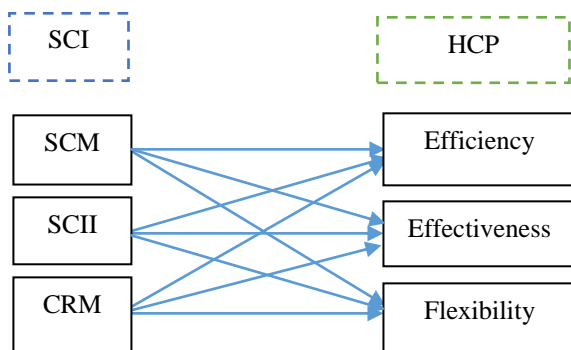


Fig. 1. Research Model

As for the research hypotheses, they can be detailed as shown in the following:

H1: There is significant effect of SC Integration (SCI) practices (SRM, SC Internal Integration, CRM) on health centers' performance (efficiency, effectiveness, flexibility).

This main hypothesis will be divided into three secondary hypotheses, and the same for these latest, each one will be detailed in three sub-hypotheses as follows:

H2: There is significant effect of SC Integration (SCI) practices (SRM, SC Internal Integration, CRM) on health centers' performance (efficiency).

H2.1: There is significant effect of SC integration practices (SRM) on health centers' performance (efficiency).

H2.2: There is significant effect of SC integration practices (SCII) on health centers' performance (efficiency).

H2.3: There is significant effect of SC integration practices (CRM) on health centers' performance (efficiency).

H3: There is significant effect of SC Integration (SCI) practices (SRM, SC Internal Integration, CRM) on health centers' performance (effectiveness).

H3.1: There is significant effect of SC integration practices (SRM) on health centers' performance (effectiveness).

H3.2: There is significant effect of SC integration practices (SCII) on health centers' performance (effectiveness).

H3.3: There is significant effect of SC integration practices (CRM) on health centers' performance (effectiveness).

H4: There is significant effect of SC Integration (SCI) practices (SRM, SC Internal Integration, CRM) on health centers' performance (flexibility).

H4.1: There is significant effect of SC integration practices (SRM) on health centers' performance (flexibility).

H4.2: There is significant effect of SC integration practices (SCII) on health centers' performance (flexibility).

H4.3: There is significant effect of SC integration practices (CRM) on health centers' performance (flexibility).

According to the research study tool, a questionnaire has been developed including six (06) main themes with 34 items. Regarding the validity test: Cronbach Alpha test for internal consistency was used, and the questionnaire reliability was (94%) after excluding the items that affected the value of the Alpha coefficient. According to the study population and sample, the study included all the health center employees. After examining responses, (03) were excluded from the statistical analysis process.

IV. RESULTS & DISCUSSIONS

- **Descriptive analysis:** A set of questions were asked in the first part of the questionnaire, which express the characteristics of the sample members, as it was found that most of the individuals were from the pharmacy department with a percentage of 38.3%, then 16.7% from the Sub-Directorate of Finance and Means, then the Department of Pediatrics by 11.1%, then Other sections with an equal percentage of 5.6% of the total respondents. It also appeared that the age of the sample members, most of them ranged

between 26 and 35 years, representing 66.7%, and then 35-50 years with a rate of 33.3%. As for the years of experience in the institution, 44% have years of experience from 5 to 10 years, and 33.3% have less than 5 years of experience, while the rest have more than 50 years of experience. 16.7% of the sample members belonged to the senior management. As for the job position of the sample members, 72.2% of them are administrative employees and 27.8% are heads of departments. 50% of the study sample members have more than 5 years of work in the position, 27.8% have worked for 2 to 5 years, and 22.2% of them have worked in the position for less than a year. According to the mean and standard deviations for all questionnaire axes related to the SC integration practices, namely SRM, SCII, CRM and health center performance (efficiency, effectiveness, flexibility), it became clear that the sample trends are positive towards all items and that the arithmetic averages ranged between 2.69 and 3.45 which generally refer to the average level.

- **Hypothesis Testing:** By reviewing the results, we find that the independent variable (SC integration practices) has a strong relationship with the dependent variable (performance), where the value of the correlation coefficient is ($R = 0.91$), and the determination coefficient is also high, where its value is ($R^2 = 0.83$). This indicates that the variation in the SCI explains 83% of the changes in performance, while the rest is attributed to other factors, and this means that 83% of the dependent variable came from the independent variable. It is also to note that the calculated value of F is (83.23), while its tabular value is (3.18). By comparing the two values, it is found that the calculated value is greater than the tabular value, which means that hypothesis H1 is accepted, which states that there is a statistically significant effect at the level (0.05) of the practices of Supply Chain (SRM, SC Internal Integration, CRM) on the health center (efficiency, flexibility, effectiveness) and this is confirmed by the Sig value of (0.000) as it is less than (0.05).

According to the second main hypothesis, H2, the results show that the independent variable (SC integration practices) has a strong relationship with the dependent variable (efficiency), where the value of the correlation coefficient ($R = 0.80$), and the determination coefficient is also high, with its value ($R^2 = 0.65$), and this indicates that the variance in the practices of SCI explains 65% of the changes in efficiency, while the rest is attributed to other factors, and this means that 65% of the dependent variable came from the independent variable.

It is also to note that F value is (30.07) while tabular F value amounted to (3.18). By comparing the two values, it is found that the calculated value is greater than the tabular value. Therefore, the alternative hypothesis H2 is accepted, which states that there is a statistically significant effect at the level (0.05) of the practices of SC integration (SRM, SC Internal Integration, CRM) on the efficiency of the public health center, and this is confirmed by the Sig value of (0.000) as it is less than (0.05).

As mentioned before, this hypothesis could be divided into three sub-hypotheses as follow:

Hypothesis H2.1: The results show that the independent variable (SRM) has a strong relationship with the dependent variable (efficiency), where the value of the correlation coefficient reached ($R=0.63$) and the coefficient of determination reached its value ($R^2=0.40$), and this indicates that the variance in the management of relations with suppliers It explains 40% of the changes in efficiency, while the rest is attributed to other factors. This means that 40% of the dependent variable came from the independent variable. We also note that the F value is (10.67) while its tabular value amounted to (3.18). By comparing the two values, we find that the calculated value is greater than the tabular value, and therefore the hypothesis H2.1 is accepted, which states that there is a statistically significant effect at the level (0.05) of SRM on the efficiency and this is confirmed by the Sig value of (0.005) as it is less than (0.05).

Hypothesis H2.2: The results show that the independent variable (SCII) has a strong relationship with the dependent variable (efficiency), where the value of the correlation coefficient reached ($R=0.68$) and the coefficient of determination reached its value ($R^2=0.47$) and this indicates that the variance in the internal management of the logistics chain It explains 47% of the changes in efficiency while attributing the rest to other factors, and this means that 47% of the dependent variable came from the independent variable. Also, we note that the F value is (14.39), while its tabular value is (3.18), and by comparing the two values, we find that the calculated value is greater than the tabular value, and therefore the hypothesis H2.2 is accepted, which states that there is a statistically significant effect at the level (0.05) of SCII on the efficiency, and this is confirmed by the Sig value of (0.002) and this shows that it is less than (0.05).

Hypothesis H2.3: The results show that the independent variable (CRM) has a strong relationship with the dependent variable (efficiency), where the value of the correlation coefficient reached ($R=0.80$) and the coefficient of determination reached its value ($R^2=0.65$), and this indicates that the variance in the management of customer relations It explains 65% of the changes in efficiency, while the rest is attributed to other factors. This means that 65% of the dependent variable came from the independent variable. Also, we note that the F value is (30.27), while its tabular value is (3.18). By comparing the two values, we find that the calculated value is greater than the tabular value. Therefore, the null hypothesis is rejected and the alternative hypothesis Ha2-3 is accepted, which states that there is a statistically significant effect at the level (0.05) CRM on the efficiency, and this is confirmed by the Sig value of (0.000) as it is less than (0.05). Considering that the various hypotheses have been tested in the same way, the results can be summarized in the following table:

TABLE 1: Summary of hypothesis testing

Hypo	Sig (0.05)	F	F	R ²	R	Results
H1	0.000	3.18	83.23	0.83	0.91	Valid
H2	0.000	3.18	30.07	0.65	0.80	Valid
H2.1	0.005	3.18	10.67	0.40	0.63	Valid
H2.2	0.002	3.18	14.39	0.47	0.68	Valid
H2.3	0.000	3.18	30.27	0.65	0.80	Valid
H3	0.000	3.18	42.80	0.72	0.85	Valid
H3.1	0.004	3.18	11.15	0.41	0.64	Valid
H3.2	0.000	3.18	19.47	0.54	0.74	Valid
H3.3	0.000	3.18	44.49	0.73	0.85	Valid
H4	0.000	3.18	27.57	0.63	0.79	Valid
H4.1	0.012	3.18	8.01	0.33	0.57	Valid
H4.2	0.000	3.18	19.56	0.55	0.74	Valid
H4.3	0.000	3.18	23.16	0.59	0.76	Valid

V. CONCLUSION

Although the results of the study showed that there is an impact of Supply Chain integration practices (SRM, SC Internal Integration, CRM) on health center’s performance (efficiency, effectiveness, flexibility), the reality reflects an immaturity of SC practices, which confirms the fact that the interviewed managers did not realize the importance of this vital approach. Through the results of this study, a set of recommendations and suggestions can be presented to enhance the role and impact of the SC integration chain practices in improving performance in the Health Center as follow: (1) the center has to ensure the information flow in both directions from and to the suppliers. (2) the center should establish and consolidate relations of cooperation and coordination with suppliers. (3) the center should collaborate with suppliers to solve problems. (4) the center should leverage the internal control systems. (5) the center should achieve an efficient internal coordination and cohesion among all departments. (6) the center should maintain a long-term relationship with its customers by interacting with their needs and developing the services provided to them with an appropriate price. (7) the center should implement a quality system to measure satisfaction besides all stakeholders.

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