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The effect of electronic supply chain management (E-SCM) on information sharing

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***Abstract*—** Supply chain integration has become a potentially valuable way of securing shared information and improving supply chain performance, since competition is no longer between organizations, but among supply chains. This research conceptualizes and develops three dimensions of supply chain integration (integration with customers, integration with suppliers, and the interorganizational integration) and tests the relationships between supply chain integration, information sharing, and supply chain performance. Furthermore, the four types of information sharing namely, information sharing with customers, information sharing with suppliers, inter-functional information sharing, and intra-organizational information sharing, while the four constructs of E-Supply Chain Performance represent expenses of costs, asset utilization, E-supply chain reliability, and E-supply chain flexibility and responsiveness. The theoretical and practical implications of the study as well as directions for future research are discussed.

Keywords— E-supply chain management, Supply chain integration, information sharing, supply chain performance.

I. INTRODUCTION

TODAY, globalization and world-wide competition along with the technological advancements create an entirely new business environment for organizations.In recent years, E-supply chain management and information technology management have attracted much attention from both practitioners and researchers. As information technology evolves, firms tend to become more integrated. Therefore, integrating of supply chain with effective information sharing becomes critical for improving supply chain performance.

E-Supply chain management (E-SCM) has become a hot topic in economics and business throughout the world. There has been much interest among managers and academics in research on E-SCM and supply chain integration (SCI) [1].

The term E-SCM includes a set of approaches and practices to effectively integrate suppliers, manufacturers, distributors and customers for improving the long-term performance of the individual firms and the supply chain as a whole in a cohesive and high-performing business model.

Several studies and authors have emphasized the importance of sharing information between customers and suppliers in supply chains.

Each business transaction requires a minimum of information exchange (i.e., placing an order, sending an invoice). Information exchanged between organizations that exceed the minimum information is referred to as information sharing. Information sharing is, however, by its nature an interorganizational activity that depends not only on one's own intention to participate, but also on trading partners' willingness and ability. Information sharing in organizations causes better decisions, capacity allocation, production and materials planning through increased transparency, demand, supply and inventory. Moreover, information sharing significantly contributes to reducing supply chain costs, increasing material flow, enabling faster delivery, improving order fulfillment rate, thus contributing to customer satisfaction, and facilitating the achievement of competitive advantage Provided that the entities of the supply chain are aware of how they can benefit from information sharing, they are more willing to share the necessary information.

II. RELATED WORK

Before starting our investigation, we conducted a literature scan. In what follows, we will identify the specificities and prerequisites of the new E- SCM practice.

III. THEORETICAL FRAMEWORK

E-SCM Definition

Electronic supply chain management (e-SCM) is collaborative use of technology to improve the operations of supply chain activities as well as the management of supply chains[2]. The main factors that contributed to the transition from SCM to E-SCM are as follows:

The need for additional reduction in the costs as well as improvements in the processes through the expansion of the tools for modern management in the organizations from the supplier channels to the customer channels.
The introduction of computerization and digitalization of the internal functions of the organizations with new techniques, tools, and management methods.
The e-business technologies, particularly internet, have enabled organizations of all sizes to have a network and be closely connected with their partners and conquer and compete for market share which was only possible before for the large corporations.

The framework proposes that SCI will have an impact on supply chain performance both directly and also indirectly through information sharing. SCI is conceptualized as a four-dimensional construct.

A detailed description of the development of the SCI construct is provided in the following paragraphs. Information sharing and supply chain performance are concepts that have been operationalized in the existing literature. Using literature support, the expected relationships among SCI, information sharing, and supply chain performance are discussed, and hypotheses relating these variables are developed.

Council of Logistics Management (CLM) defines E-SCM as the systemic, strategic coordination of the traditional business functions and tactics across these businesses functions within a particular organization and across businesses within the SC for the purposes of improving the long-term performance of the individual organizations and the SC as a whole. Thus, it is reasonable to argue that the level and effectiveness of SC integration may influence how successful firms are achieving the intended results stemming.

The effective E-SCM is not achievable by any single enterprise, but instead requires a virtual entity by faithfully integrating all involved partners, who should come up with the insightful commitment of real-time information sharing and collaborative management.

The argument above implies that SCI may play a role as an infrastructure for the intensification of information sharing between supply chain members.

While the SCI varies widely across firms, many companies reported limited success integrating with their immediate trading partners, either suppliers or customers through the sharing of information.
The above arguments lead to: SCI positively influences information sharing.

[3] defined e-management as a management mode integrating information and collaboration technologies like E-CRM, E-SCM…….
Therefore, buyer–supplier relationship architecture can be expected to exert a direct positive effect on formation of a strategic alliance. Moreover, enhanced supply chain coordination by means with supply chain partners, in turn, can positively influence supply chain performance.

The SCI framework developed in this study proposes that SCI has a direct impact on the SCP. For example, E-SCM practice is expected to increase an organization's market share, return on investment, and improve overall competitive position as well as SCP. Of the same, strategic supplier partnership can improve supplier performance and increase the level of responsiveness for the SC . Therefore, this study explicitly investigates the influence of collaborative and cooperative, trust based relationships enabled through the SCI, to achieve higher SCP. A positive relationship between SCI and supply chain performance can be proposed: SCI positively influences supply chain performance.

Information sharing can significantly improve the performance of a supply chain. Additionally, companies can redesign their SC strategies through information sharing to increase profit. However, some studies implicitly suggest information sharing as a predicting factor of increased supply chain performance, but few studies explicitly examines the impact of information sharing on SCP. Hence, according to this theoretical framework we propose the following hypothesis: Information sharing positively influences supply chain performance.

The major infrastructure elements and tools of e-SCM:
Supply chain management is coordination of all supply activities of an organization from its suppliers and partners to its customers efficiently and effectively [4]. The key activities of e-SCM use a variety of infrastructure and tools. The following are the major infrastructure elements and tools of E-SCM:
•Electronic data interchange (EDI). It is the major tool used by large corporations to facilitate supply chain relationships. Many companies are shifting from traditional EDI to Internet-based EDI.
•Its major purpose is to support inter organizational communication and collaboration.
•Workflow systems and tools. These are systems that manage the flow of information in organizations.
•Groupware and other collaborative tools. Many tools facilitate collaboration and communication between two parties and among members of small as well as large groups.
•Identification and tracking tools. These tools are designed to identify items and their location along the supply chain.

IV. METHODOLOGY

DATA COLLECTION

The data needed for field search have been collected through survey research method, which is described and analyzed in more detail in the following sections.
The sample consisted of 140 medium and large sized firms in total, residing in Tunisia. This study sought to choose

respondents who can be expected to have the best knowledge about the operation and management of the SC in his/her organization.
Based on literature and recommendations from practitioners, it was decided to choose logistics managers who are at higher managerial levels as respondents for the current study.
Accordingly, SCP is categorized under four dimensions from the research of [15], namely expenses of costs (8 items), utilization of assets (6 items), supply chain reliability (7 items) and responsiveness and flexibility (5 items).

DATA ANALYSIS AND RESULTS

THE EXPLORATORY FACTOR ANALYSIS

Before applying a Principal Component Analysis on the items making up each variable, it is necessary to test the normality of the distribution. This step presents one of the conditions inherent to the application of the Principal Component Analysis.

An examination of the asymmetry and concentration coefficients shows that all the items measuring the three variables follow the normal distribution. Indeed, the Symmetry coefficient (Skewness) is ≤ / 3 / and the flattening coefficient (Kurtosis) is ≤ / 8 / for the variables SCI, information sharing and supply chain performance.
For SCI, a factor analysis was conducted using the 21 items that measure the 3 dimensions.
For simplicity, only loadings above 0.50 are displayed. However, all elements loaded on their respective factors have loads above 0.50. Therefore, no item is to be eliminated.

The sharing information construct was initially represented by four dimensions and 22 items. A factor analysis indicated that four items had a crossload of less than 0.5. Moreover, When the SCP was factor analysed; five factors emerged with a non-significant cross loading. These items have been eliminated and factor analysis was performed on the remaining items.
The reliability values for all constructs are all greater than 0.70, which are considered acceptable.
According to these analyses, the factors of the variables are sufficiently valid and reliable to test hypotheses.

CONVERGENT AND DISCRIMINANT VALIDITY

The reliability and average variance extracted (AVE) of the second-order factors namely; SCI, information sharing and.

All values highlight the fact that the second-order factors are above the required value which is suggested in the literature. In fact, all values exceed the threshold of 0.5 [5].
Concerning the discriminant validity, the square roots of average variance extracted are inscribed in the diagonals; the other values are the correlations between the dimensions.

We can conclude that the discriminant validity is satisfactory (the square root of AVE of each dimension is greater than the correlation coefficients displayed with the other dimensions). This implies that the constructs and their measures can be adequately discriminated against.

RESULTS FOR THE STRUCTURAL MODEL

Overall, the model has a satisfactory with GFI =0.824. AGFI = 0.694. NFI=0.853 and CFI=0.874. The RMR is only 0.042, which is very good.
The results support Hypothesis 1, which states that SCI positively influences information sharing.

The standardized coefficient is 0.31which is statistically significant at P <0.05 (t = 3.11>1.96). The statistical significance of Hypothesis 1 confirms that SCI can have a bottom-line influence on the information sharing. The implementation of SC may directly improve the transfer of reliable information in real time both through partners in the supply chain outside and in the functions of the individual organization.

Hypothesis 2 is also supported which indicates that SCI has a direct impact on supply chain performance.
The standardized coefficient is 1.05 which is statistically significant at P <0.05(t = 2.14>1.96). Therefore, the implementation of SC can directly improve the reliability, responsiveness, speed, quality, cost and flexibility of delivery in the long-term supply chain.

The results also indicate that higher levels of information sharing may lead to improved supply chain performance, thus confirming Hypothesis 3. The standardized coefficient is 4.53 which is statistically significant at P <0.05 (t = 2.01>1.96).
The results also show that supply chain performance is more influenced by information sharing (B = 4.53) than by SCI (B =1.05).
In the literature, SCI, mostly, has been linked directly to supply chain performance. The findings of this research indicate the presence of an intermediate measure of information sharing between SCI and supply chain performance.
The study focuses on the causal relationships between SCI, IS and SCP and ignores the possible recursive relationships.

V. RESULTS AND DISCUSSION

It can be seen that all three hypotheses are supported, resulting in a positive triangular relationship between SCI, IS and SCP. Therein, the results constitute indication towards supporting the suggested relationships.

The results suggest that JIT considerations, specifically buyer–supplier relationship architecture, can improve the capability to form strategic alliances and thereby improve key performance measures of a supply chain. Therefore, information sharing can significantly improve the performance of the supply chain.

The results show that integration with suppliers and customers strengthens confidence-based relationships, examines demand forecasts and decisions to replenish stocks by retailers and establishes long-term contractual arrangements. On the other hand, the intra-organizational integration creates a systematic approach to process the information gathered from outside and a division of labor among the organization' employees thus facilitating the flow of information throughout the organization.

VI. CONCLUSION AND FUTURE SCOPE

Our research reveals the following suggestions regarding the improvement of SCP through SCI and IS:
Considering the forecasted demand and accordingly making the manufacturing and distribution plans,
Providing a IT infrastructure which enables the real time diffusion of information within the organization, the study also suffers from the common limitations related to methodological choices, including the problem of sample size issues and the use of a single respondent from each firm. This, however, presents an opportunity for further research. ERP, ECRM, E-CRM: Use of IT to create a cross-functional enterprise system.

There was not an industrial separation while evaluating data; results may vary for different industries. Despite these limitations this study provides important implications in the context of a developing country from theoretical and practical perspectives.
The findings of this research support the view that SCI has a discernible impact on information sharing and supply chain performance.

It should be noted that the E-SCM practices maybe influenced by contextual factors, such as the type of industry, firm size, a firm's position in the supply chain, supply chain length, and the type of a supply chain. For example, the level of information quality maybe influenced negatively by the length of a supply chain, as information suffers from delay and distortion as it travels along the supply chain; thus, the shorter the supply chain, the less chance it will get distorted.

While our study relied on arguments for sharing information, other studies could examine alternative theoretical frameworks to study this important phenomenon to further contribute to theory-building in E-SCM.

Future research should revalidate measurement scales developed through this research. Future research can expand the domain of SCI by considering additional dimensions such as geographical proximity, cross-functional coordination and logistics integration which have been ignored from this study. In addition, future studies can also examine the proposed relationships by bringing some contextual variables into the model, such as organizational size and supply chain structure. For example, it will be intriguing to investigate how E-SCM practices differ across organization size.

More precisely, we consider SCI and information sharing as independent constructions; the indirect link between SCI and the performance of the logistics chain will be abandoned and the direct link between information sharing and the performance of the logistics chain will be eliminated.

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