**International Journal of Computers in Clinical Practice**
Volume 3 • Issue 1 • January-June 2018

# The Dynamics of Electronic Supply Chains and Enterprise Resource Planning Systems:

## The New Business Challenge

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### ABSTRACT

Businesses around the world experience many challenges to acquire raw materials, parts, subassemblies, and the other necessary inputs to their production systems. As businesses are all moving into the e-commerce platform to gain market shares, they realize that electronic supply chain management (e-SCM) powered by enterprise resource planning systems (ERPs) are the new norms and no business organization can operate without both in the new world of e-commerce. Little attention has been devoted to e-SCM dynamic with ERP and the challenges they pose to organizations. In the e-commerce environment, e-SCM is among the most important factors to organizational success. Effective e-SCM can enhance competitiveness and increase market share leading a higher profitability. Nevertheless, the new e-SCM professionals and other actors must understand the factors that undergird e-SCM performance, their drivers, and the necessity of fully functional ERPs for an effective e-SCM.

### KEYWORDS

Electronic Supply Chain, E-Logistical Drivers, E-Logistics, E-Supply Chain Management, Logistics Capabilities, Logistics Protocol, Supply Chain Facilities, Supporting Facilities

### INTRODUCTION

Businesses around the world experience many challenges to acquire raw materials, parts, subassemblies, and the other necessary inputs to their production systems. Organizations must work to ensure they excel or simply survive in this extremely competitive environment. As businesses move into the e-commerce platform to gain market shares, they realize that electronic supply chain management (e-SCM), powered by enterprise resource planning systems (ERPs), is the new norm and no business organization can operate without both e-SCM and ERPs in the new world of e-commerce. Because business via the internet requires different fulfillment approaches, traditional drivers of regular supply chains are no longer adequate for explaining how e-SCM performance is driven. The task of e-SCM professionals is, therefore, more complicated than ever. This situation often leads to unsatisfied customers, which can force companies to close their doors. Therefore, understanding the dynamics of e-SCM performance drivers and their integration with ERPs, along with their accompanying challenges, becomes a necessity. Little attention has been devoted to e-SCM dynamics with ERPs

DOI: 10.4018/IJCCP.2018010104

and the challenges they pose to organizations. This article discusses the new e-SCM challenges facing organizations as they attempt to enter the e-commerce platform. In the e-commerce environment, e-SCM is one of the most important factors to organizational success. Effective e-SCM can enhance competitiveness and increase market share, leading to higher profitability. Nevertheless, the new e-SCM professionals and other key players must understand the factors that undergird e-SCM performance, their drivers, and the necessity of fully functional ERPs for an effective e-SCM.

Information technology (IT) has changed the way businesses conduct their operations (Hanafizadeh, Ghandchi, & Asgarimehr, 2017). Today's IT is at the heart of every business operation. An IT breakdown usually leads to work stoppage. Here are two examples: (1) IT breakdowns often paralyze airport operations, leading to flight cancellations and angry passengers, and (2) a dysfunctional check-in or checkout system creates infinite waiting lines and hinders the company's reputation. Consequently, e-commerce has forced businesses to redesign their operations dramatically (Sambasivan, Mohamed, & Nandan, 2009). E-commerce offers a new venue for revenue generation that sometimes surpasses that of the traditional brick-and-mortar business. E-commerce offers consumers more buying options than does traditional business. Buyers can instantly compare prices, product attributes, and delivery parameters. As a result, customers have become increasingly demanding as they raise their expectations when buying from the internet. On the other hand, e-commerce requires the use of the internet, creating a new SCM challenge. Therefore, e-SCM is becoming an integral part of traditional supply chain management (Gunasekaran, Patel, & Tirtiroglu, 2001; Sambasivan et al., 2009). Consequently, businesses are becoming supply chain-sensitive organizations. With business via the internet requiring different fulfillment approaches, traditional drivers of regular supply chains are no longer adequate for explaining how and to what extent e-SC performance is driven (Sambasivan et al., 2009). The task of supply chain professionals is more complicated than ever because e-SCs rely on ERPs. This situation often leads to unsatisfied customers, which can force companies to close their doors because of lost profit.

Effective SCM is customer-centered and ensures cost-effective resource allocations. However, to be cost-effective, supply chain managers must demonstrate full understanding of factors that drive SCM performance and how to gauge actual performance to take proper actions (Stock & Boyer, 2009). According to Caputo, Cucchiella, Fratocchi, Pelagagge, and Scacchia (2004), SC managers are often driven by their personal experiences and routine methodologies that do not usually lend themselves to the expected results.

Supply chains involve all processes that support demand planning, procurement, production, logistics, and distribution (Petrovic, 2016). E-SCs involve partners that are linked by internet technology in broad networks where customers, retailers, distributors, manufacturers, and suppliers are connected (Fliedner, 2003; Lightfoot, & Harris, 2003; Williams, Esper, & Ozment, 2002). Within and across the networks, key players collect, process, store, and disseminate information on materials, goods, funds, and services. e-SCs are composed of many-to-many connections, while relationships in traditional supply chains are characterized by one-to-one connections. Because of the widespread use of internet technology today, a dramatic revision of current SCM techniques is needed (Caputo et al., 2004). Therefore, understanding e-SCM performance drivers and their integration with ERP becomes a necessity for any SCM professional. Based on the literature survey, little attention has been devoted to SCM performance driver evaluation despite the high volume of ongoing research in the field (Gunasekaran et al., 2001; Sambasivan et al., 2009).

This paper examines the challenges facing e-supply chain management, the performance drivers of e-SCs, the metrics for measuring efficiency, and their integration with ERPs. Considering the fact that e-SCs are becoming an integral part of the extended enterprise (Sambasivan et al., 2009), the first section of this article introduces a model of the traditional supply chain for both manufacturing and service systems. In addition, it assesses the logistical and cross-functional performance drivers of supply chains (Chopra & Meindel, 2010; Olver et al., 2010). The section concludes with a brief comparison between a physical product and information flow.

The second section examines e-SC structures and performance metrics for capturing and gauging system effectiveness and efficiency. It also explains the corresponding measures for the implementation of each metric. It should be noted that e-SC metrics and their corresponding measures are effective ways for managers to ensure that the supply chain is achieving its expected benefits (Riggins & Mitra, 2001).

The role of information technology has shifted from passive enabler to high-performing processes that directly impact the organization's performance. Because e-SC performance requires integration (Smart, 2008), the third section discusses the integration of ERPs into e-SCs to enhance their performance. In this last section, the author discusses the effectiveness and efficiency benefits of ERP for e-SCs (Sambasivan et al., 2009).

SCM is among the most important factors to organizational success (Gunasekaran et al., 2001). Many benefits of e-SCs are quantifiable while others are not (Singh & Byrne, 2005). Effective SCM can enhance competitiveness and increase profitability. Nevertheless, SCM professionals and other key players must understand the factors that undergird driver performance in order to achieve a competitive advantage.

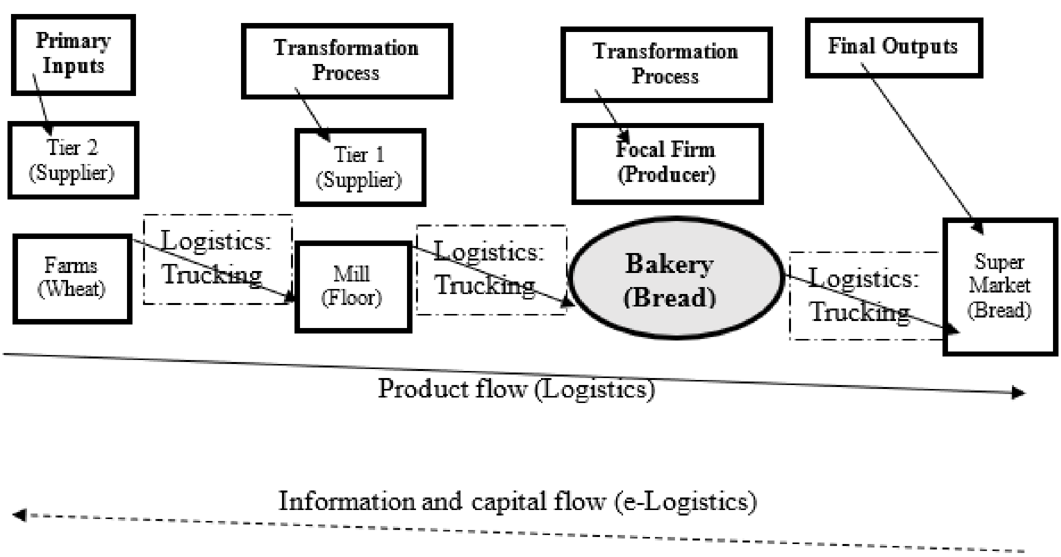
The fourth section discusses challenges facing e-SCM and some strategies for mitigating the negative effects of these challenges.

## BACKGROUND

Supply chains are sequences of organizations involved in the production of a good and/or the provision of a service (Stevenson, 2018). The author argues that organizations generally consist of facilities, functions, or units and that they carry out production or service provision activities. Therefore, their facilities, functions, and activities, which are involved in the production or service provision, are integral parts of supply chains. Facilities may include operating units, such as factories, storage facilities such as warehouses, processing centers, distributions centers, and even offices, since information is manipulated to trigger, move, and track products and services within and throughout the supply chain. Figure 1 depicts an example of a supply chain for bread.

As depicted in Figure 1, the chain of supply starts with a farming product: the wheat on a farm. Next, the wheat is transported to the mill that processes wheat and converts it into flour. The primary

Figure 1. Model of supply chain: Supply chain for bread (Logistics and e-logistics)



input to flour is the wheat, and the transformation process converts a non-manufacturing good (wheat) into a manufactured one (flour). The outbound logistics through trucking occur at the farm and the inbound logistics part occurs with the incoming freight at the mill company. The trucking activities from farms to the mill represent the external supply chain. However, internal supply chain activities occur with the mill facilities. These short distance movements within a supply chain partner's facility are often referred to as material handling and transfers. The floor is, therefore, the primary output and the secondary input to the supply chain of bread. The floor is then converted into bread at the bakery facility. The supply chain of bread ends at the supermarket where the customer purchases it. Products flow from suppliers to the end consumer; information and capital flow in the reverse direction.

In general, every product is made through its supply chain within and across multiple sequential organizations. The main conceptual dilemmas have always been: (1) What activities and components of an organization should that organization include in its given supply chain? (2) Where are the boundaries of SCM territory?

The consensus today seems to be that the supply chain begins with the original suppliers of raw materials. This beginning is followed by production in an operating unit and storage in processing centers and warehouses. The supply chain ends with the delivery of the finished item to the user. Therefore, supply chains existed since the creation of the first good. However, developing a consensus definition of a supply chain has not been an easy task for academicians and practitioners.

Stock and Boyer (2009) examined 173 unique definitions of SCM from systematic reviews of the entire decision science field in an effort to frame the adoption of a consensus definition of SCM. The definitions were considered unique because they added at least one new element that differed from existing definitions. This inquiry was performed based on the assumption that in the absence of a uniform, agreed-upon definition, it would be impossible to advance the SCM theory and practice (Stock & Boyer, 2009). The study identified three themes (activities, benefits, and constituents) associated with the definition of SCM. Six sub-themes were also identified. The theme titled "benefits" consisted of three sub-themes: value added, efficiency created, and customer satisfaction. These three sub-themes accounted for 47, 35, and 28 percent, respectively. The theme titled "activities" was credited with physical (materials), services, finances, and information flows counting as its first sub-theme, with networks of internal and external relationships as its second sub-theme. However, a variety of theories continue to exist as to what a supply chain is and how SCM should be defined (Mentzer et al., 2001).

With the advent of the internet and its business applications, the world has witnessed a new type of supply chain, the e-SC. This addition increased confusion regarding the conceptualizations on SCM. Confusions upon definitions of SCM existed in both the academic and practitioner circles (New, 1997; Tan, 2001). This article is based on the existing literature in an attempt to frame a comprehensive understanding of the concept of an e-SC, its performance drivers, accompanying metrics, and integration with ERPs. A framework for structuring e-SC drivers helps to achieve a strategic fit between the supply chain strategy and the organization competitive strategy (Chopra & Meindel, 2010).

## BRICK-AND-MORTAR SUPPLY CHAINS

### Traditional Supply Chain Models and Drivers

#### *Manufacturing and Service Supply Chain*

As previously mentioned, the Stock and Boyer (2009) study that compiled 173 unique definitions of SCM proposed a new consensus and encompassing definition of SCM. SCM is the management of networks of relationships within and throughout organizations consisting of suppliers of raw materials, procurement, production units, logistics, and marketing that facilitate bidirectional flow of goods, services, funds, and information from the original supplier to the end-user with the benefits of adding value and maximizing profit while increasing customer satisfaction (Stock & Boyer, 2009). E-SCs focus on the management of the information flow, managing technology and information processes to optimize the flow of goods, finances, and materials to achieve customer satisfaction and competitive advantage (Srinivasan, 2010).

### *Model of Manufacturing and Service Supply Chain*

Models are selected and used as simplified representations of reality. Models facilitate understanding of phenomenon or concepts. This section introduces models of traditional supply chains for both the manufacturing and service sectors. To illustrate supply chains, Fawcett, Ellram, and Ogden (2007) suggested the following simple models of manufacturing and service supply chains:

1. Simple model of a hotel service supply chain;
2. Simple model of a manufacturing supply chain.

As depicted in Figures 2 and 3, models of supply chains are viewed from the central ring of the chain (also known as the focal firm). The focal firm is the departing point to both the left and the right. Partner firms to the left of the focal firm form the upstream side of the supply chain. Those to the right form the downstream side of the supply chain. Upstream partners are also known as tier “n” suppliers. Most definitions in the literature describe supply chains as the flow of materials, information, services, and funds from the suppliers of suppliers all the way down to the final consumers. The flow is symbolized by arrows as depicted in Figures 1 and 2. Some authors argue that the essence of SCM is to manage the flow of goods and information from the point of departure to the point of consummation, implying a unidirectional flow (Arthur, 1991; Zsidisin, Jun, & Adams, 2000). In fact, information, materials, services, and funds all follow a forward and backward path through the supply chain (Svenson, 2002; Towill, Childerhouse, & Disney, 2001). Svenson explained that the demand information flows upstream from the consumers; materials, funds, and services flow downstream in the supply chain.

### *Drivers of Traditional Supply Chains*

According to Olver et al. (2010), supply chain performance is driven by both logistic and cross-functional factors. Olver et al. (2010) argue that analyzing supply chain drivers helps

**Figure 2. Simple service supply chain (adapted from Fawcett et al., 2007) (Source: Essila, 2015)**

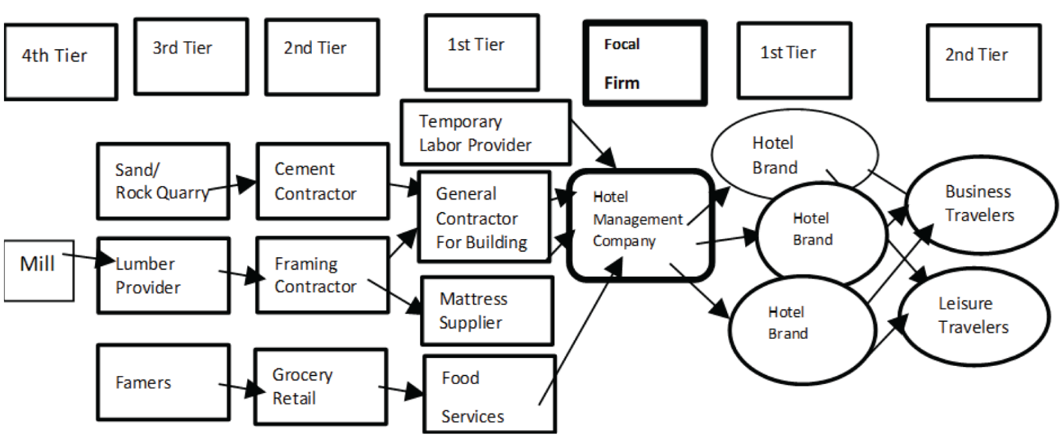
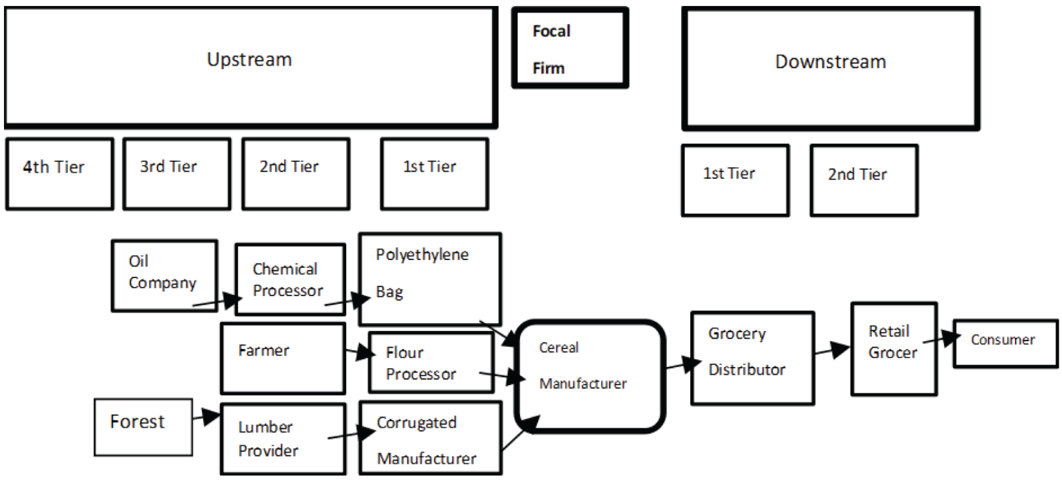
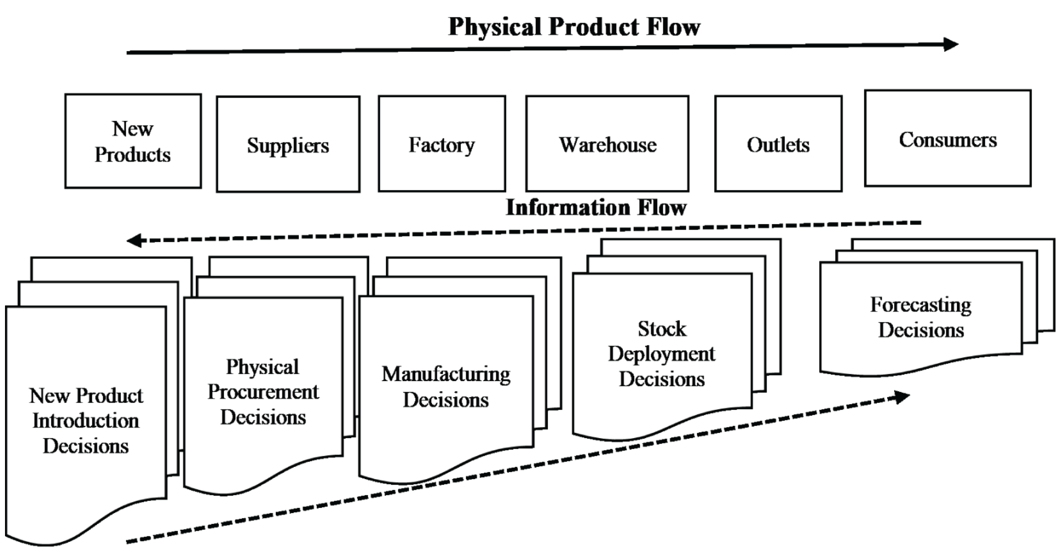


**Figure 3. Simple manufacturing supply chain (adapted from Fawcett et al., 2007) (Source: Essila, 2015)**




to understand how organizations can improve their supply chain productivity to become more responsive and efficient. Logistics drivers are manufacturing and supporting facilities, inventories, and transportation. Supporting facilities are physical locations needed to provide a service (Fitzsimmons & Fitzsimmons, 2011). Hospital buildings, doctors' offices, airplanes, or classrooms are examples of supporting facilities. Cross-functional drivers of supply chains are sourcing, pricing, and information. Information affects and is directly affected by all other drivers. It is, therefore, the biggest driver of a supply chain (Olver et al., 2010). Figure 4 depicts both physical and information flow in the supply chain.

**Figure 4. Physical and information flow in the supply chain (adapted from Sherer, 2005) (Source: Sherer, 2005)**



## BRICK-AND-MORTAR SUPPLY CHAINS VS. E-SCS

### Structures, Drivers, and Measures

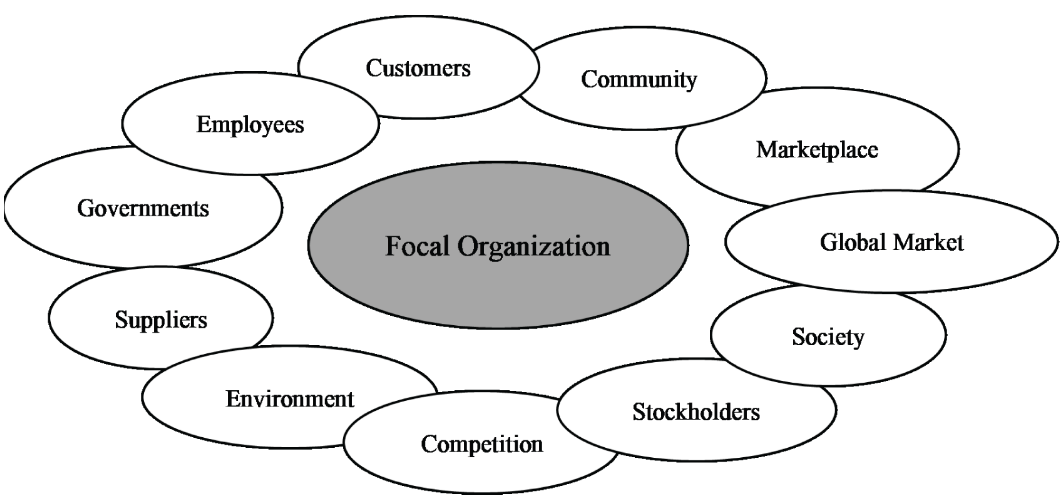
#### *e-SCs*

e-SCs encompass partners that are connected by internet technology in broad networks where customers, retailers, distributors, manufacturers, and suppliers are all linked (Fliedner, 2003; Lightfoot & Harris, 2003; Williams et al., 2002). Within and across the networks, the key players collect, process, store, and disseminate information on materials, goods, funds, and services. e-SCs are composed of many-to-many connections while relationships in a traditional supply chain are characterized by one-to-one connections. A dramatic revision of current SCM techniques is needed (Caputo et al., 2004). The primary purpose of e-SCs is to help organizations increase effectiveness, improve efficiency, and achieve strategic benefits, such as revenue increase and competitive advantage, by establishing customer loyalty (Riggins & Mitra, 2001; Van Hooft & Stegwee, 2001). Next, the researcher introduces the structure of a typical e-SC.

#### *e-SC Structures*

Wheatley (1999) predicted that in the realm of business, the amount of investment on brick-and-mortar facilities will be replaced by investment in technology. An increase in investment puts more pressure on e-SC managers to achieve high performance in order to yield a higher return on investment. Traditional arm's length, horizontal, and vertical integrated structures are no longer appropriate for e-SCs since they connect organizations. Unlike traditional supply chains, "the electronic supply chain is round in form" (Williams et al., 2001, p. 708). The traditional supply chain goal is to increase responsiveness and efficiency through long-term stability. Traditional supply chains usually build relationships that can achieve a long-term benefit among partners. On the other hand, e-SCs are designed to adapt to the dynamic environment of an e-business. Therefore, they are flexible in nature. Supply chains shape the organizational structure for future performance enhancements. As depicted in Figure 5, firms are connected through information technology. The focal firm is represented by a central ring. Other partners in the e-SC are represented by outer rings.

**Figure 5. The e-SC structure (adapted from Williams et al., 2002) (Source: Williams et al., 2002)**



## Drivers and Metrics of Traditional Supply Chains

Unlike e-SCs, traditional supply chain design initiatives are generally viewed as top to bottom processes similar to the classical waterfall-type model in systems engineering. The examination of the six drivers, along with their corresponding metrics and accompanying measures, reveals the need for more stable relationships with partners. The advent of globalization and the internet has dramatically changed the paradigms. Supply chain leaders need to adjust their strategies and structure the six drivers of traditional supply chains depicted (see Table 1) in order to achieve a high level of responsiveness while minimizing logistics costs to the entire supply chain.

### *Drivers and Metrics of e-SC*

As mentioned, drivers of traditional supply chains are facilities, transportation, inventory, information, sourcing, and pricing. They are classified as either logistical or cross-functional performance drivers (Olver et al., 2010). Unlike traditional supply chains, factors that affect e-SC performance are the adapted organizational structure, which effectively manages relationships among network partners, the managerial criteria, and the e-SC critical activities (Caputo et al., 2004). Critical activities can, therefore, be viewed as logistical drivers. The organizational structure and managerial criteria can be viewed as cross-functional drivers of the e-SC factor equation.

**Table 1. Drivers, metrics, and measures of traditional supply chains (developed based on Olver et al., 2010)**

| Driver Type | Drivers | Metrics | Measures |
|---|---|---|---|
| • Logistical | • Facilities | • Design capacity<br>• Effective capacity<br>• Capacity cushion<br>• Utilization<br>• Efficiency<br>• Product variability | • Production per unit<br>• Production cycle time<br>• Flow time<br>• Flow time efficiency<br>• Production service level<br>• Average batch volume |
| • Logistical | • Inventory | • Inventory cycle<br>• Safety stock<br>• Product availability<br>• Obsolescence | • Average inventory<br>• Inventory turns<br>• Average replenishment lot size<br>• Rate of obsolete inventory |
| • Logistical | • Transportation | • Network design<br>• Shipment<br>• Transportation mode selection process | • Inbound cost per period<br>• Outbound cost per period<br>• Inbound average shipment size<br>• Outbound average shipment size<br>• Volume per mode |
| • Cross-functional | • Information | • Demand forecasting accuracy<br>• Process design type (push vs. pull)<br>• Sharing and coordination<br>• Availability<br>• Accessibility<br>• Enabling technology (ERP, EDI, RFID, and SCM)<br>• Encryption | • Mean absolute deviation (MAD)<br>• Mean squared error (MSE)<br>• Forecasting horizon<br>• Frequency of update<br>• Information velocity<br>• Transactions per users per enabling technology<br>• Reliability of enabling technologies |
| • Cross-functional | • Sourcing | • In-house/outsource rate<br>• Supplier selection<br>• Purchasing/Procurement<br>• Quality of supply | • Average purchasing price<br>• Purchasing range<br>• On-time deliveries to total deliveries<br>• Receipts defect rate (RDD) |
| • Cross-functional | • Pricing | • Price menu<br>• Profit | • Range of sale price<br>• Average sale price<br>• Incremental fixed/variable cost per unit |

Due to their unique characteristics, e-SCs need new metrics to adapt to challenges using innovative solutions that take into account the new dynamic environment (Barnes & Hinton, 2007). Little attention has been given to supply chain metrics and their accompanying measures (Sambasivan et al., 2009). Effective SCM requires an optimal balance between responsiveness and efficiency. Because each driver interacts with the others, supply chain managers must effectively combine the logistical and cross-functional drivers to avoid conflicting goals (Olver et al., 2010). From a practical perspective, the working technique is to increase positive impacts while minimizing the negative effects on the entire logistics system. A strategic alignment between the supply chain strategy and the organization competitive strategy is also important. Since competitive strategies support corporate strategies, the necessary strategic alignment becomes a central nerve for e-SC performance.

In SCM, metrics track and gauge performance of each driver, as well as the impact resulting from its interaction with the others. Sambasivan et al. (2009) suggested six practical metrics for e-SCs: Web-enabled service, data reliability, time and cost, e-response, invoice presentation and payment, and e-document management. e-SC metrics capture performance both at the aggregated and organizational level. The aggregated level measures the performance of the entire supply chain, encompassing all partners to the supply chain. The organizational level focuses on individual organizational performance, including the process and the performer levels. The accompanying measures for each performance metric are summarized in Table 2. It provides a summary of the three e-SC drivers, in addition to their metrics and measures.

**Table 2. e-SC metrics and their accompanying measures (developed based on Caputo et al., 2004; Sambasivan et al., 2009)**

| Driver Type | Drivers | Metrics | Measures |
|---|---|---|---|
| • Logistical | • Adapted organizational culture | • Web-enabled service | • Data access time<br>• System response time<br>• Data transmission speed between business-to-business applications<br>• Number of system verification steps<br>• Traffic volume per page and/or site |
| • Cross-functional | • Managerial criteria | • Transaction reliability | • Number of transaction errors<br>• Number of backlog transactions<br>• Number of partners accessing the system<br>• Cost per transaction<br>• ERP interface cycle time |
| • Cross-functional | • Managerial criteria | • Cost | • Administrative cost |
| • Cross-functional | • Critical activities | • Time | • Administrative time<br>• Number of stages in the purchasing cycle<br>• Purchasing lead time<br>• Procurement cycle time<br>• Procurement response time |
| • Logistical | • Adapted organizational culture | • E-Response | • Reliability of mail service<br>• Completed number of transactions per period (day, week, or month)<br>• Pending number of transactions per period (day, week, or month) |
| • Cross-functional | • Adapted organizational culture | • E-Invoice process | • Number of steps involved<br>• Dispute resolution completion time |
| • Logistical | • Adapted organizational culture | • E-Payment | • Payment time<br>• Reconciliation time |
| • Cross-functional | • Managerial criteria | • E-Document | • Data accuracy<br>• Data reliability |

Information is the key driver of both traditional and e-SCs because it serves as the connector to all drivers (Olver et al., 2010). Information affects and is affected by all supply chain drivers. It triggers logistical and cross-functional processes associated with supply chain performance factors. For example, information on customer demand is the basis for the aggregate plan that establishes operation capacity. The operation capacity and capability dictate the rules for establishing schedules for specific products or groups of similar items. At this planning stage, basic strategies are formulated to meet demand using a chase demand or level capacity strategy.

At every stage in the supply chain process, bi-direction flows of information play a critical role. As a leading performance driver, information sets the stage for potential productivity gains for both logistical and cross-functional processes within, across, and throughout the entire supply chain. Information is a cross-functional driver of a supply chain (Oliver et al., 2010). As depicted in Table 2, information is a major supply chain driver of traditional and e-SCs. All supply chains often rely on enabling technology such as ERP, electronic data interchange (EDI), radio frequency identification (RFID), and SCM software. For e-SCs, enabling technology is a necessity. Such technology enables organizations to collect, store, process, and disseminate information within and across the entire supply chain. Next, the article will explain the necessary integration between e-SCs and ERP.

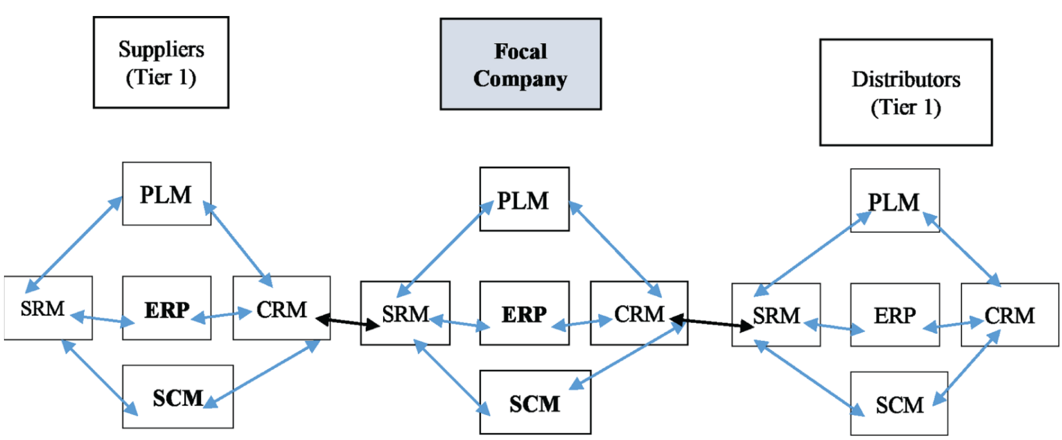
## E-SC INTEGRATION WITH ERP

### ERP Integration

ERPs, the third generation of enterprise systems (ESs), began with material requirements planning (MRP) in 1964. This was followed by manufacturing resource planning (MRP II) in 1983. ERPs are currently the most complex version of ESs to integrate both the functional and cross-functional process in the organization. ERPs have MRP as their core system. ERPs support all business function operations and transactions, linking them in a uniform platform to make information available in real-time across the organization's entire supply chain. ERPs track the information within and across organizations. The internet provides a broad visibility of the information. Supply chain managers utilize information provided by ERPs as the basis for making informed decisions.

A close look at an ES application suite reveals the necessity to integrate ERPs with SCM software. As depicted in Figure 5, the five basic components of a simple ES are the product life cycle management (PLM), the supplier relationship management (SRM), the ERP, the SCM, and the customer relationship management (CRM). ERPs are the epicenter of ESs because they integrate and connect the other ES components. Figure 6 depicts the enterprise application suite in the supply chain.

**Figure 6. Enterprise application suite in the supply chain (adapted from Magal & Word, 2011) (Source: Magal & Word, 2011)**



ERP systems are configurable ESs designed to integrate processes and information within and across organizations (Kumar & Van Hillegersberg, 2000). ERPs allow organizations to automate repetitive tasks, underlining transactions and processes. If properly used, SCM can be improved by integrating ERPs. Organizations that are best placed to succeed are those that have implemented an adequate business infrastructure utilizing ERP capabilities (Srinivasan, 2010). ERPs help to increase velocity in the supply chain fulfillment process.

## E-SUPPLY CHAIN'S DYNAMICS WITH ERP AND CHALLENGES

The presence of various forces, such as electronic supply chain management (e-SCM) and enterprise resource planning systems (ERPs), within the organization creates a dynamic that often poses many threats and challenges to business operations. The interaction between e-SCM and ERPs provides an opportunity to gauge e-SCM performance under ERPs and vice-versa.

## FUTURE RESEARCH DIRECTIONS

This article identified variables relevant to the measurement of an effective e-SC. A similar study with more focus on the relationship among e-SC performance drivers that would allow a moderate (or even excessive) interference with a purpose of establishing a more elaborate causal relationship would provide more insight into the underlying construct. A longitudinal field experiment on the subject would also derive more detailed information about performance drivers of e-SCs.

Research could also be directed toward testing the hypothesis about the quality of enabled-technology used in an e-SC, as well as its effect on both efficiency and responsiveness. Suggested questions and ideas include:

1. Does full use of technology in the e-SC lead to greater effectiveness and a higher return to stakeholders?
2. What factors influence how supply chain professionals feel about the full use of technological supply chain capability?
3. If an entirely automated e-SC system were possible, would it be more effective?
4. Research could look more closely at traditional supply chains and technologically-assisted e-SCs to elaborate a classification of technologically-assisted e-SC systems with a measure of the extent or magnitude of technology involved.

## CONCLUSION

As businesses are all moving into the e-commerce platform to gain market shares, they realize that electronic supply chain management (e-SCM), powered by enterprise resource planning systems (ERPs), is the new norm and no business organization can operate without both e-SCM and ERPs in the new world of e-commerce. Because business via the internet requires different fulfillment approaches, traditional drivers of regular supply chains are no longer adequate for explaining how e-SCM performance is driven. The task of e-SCM professionals is, therefore, more complicated than ever. This situation often leads to unsatisfied customers, which can force companies to close their doors. Therefore, understanding the dynamics of e-SCM performance drivers and their integration with ERP along with their accompanying challenges becomes a necessity. With the advent of globalization and the emergence of e-business, e-SCs are imperative. Organizations now compete using marketing, operations, and supply chain functions. Companies are no longer competing as stand-alone entities in today's business dynamic environment (Lambert & Cooper, 2000).

This article reviewed the six performance drivers of traditional supply chains based on the Olver et al. (2010) framework: facilities, inventory, transportation, information, sourcing, and pricing. The first three are referred to as logistics drivers because they are directly responsible for moving materials, funds, information, and service throughout supply chain pipelines. Information, sourcing, and pricing are known as cross-functional drivers of supply chains because they involve many business functions and processes. Traditional supply chain drivers aim to build long-term relationships among partners. They involve one-to-one relationship types. Early supply chains were arm's length and horizontally and vertically integrated in nature.

The emergence of the internet and e-business calls for new types of supply chains—e-SCs. Unlike traditional supply chains, e-SCs are round in nature (Williams et al., 2001), and involve a many-to-many relationship among their partners. An e-SC initiative is designed to adapt to a dynamic environment. Therefore, they strive for flexibility and adaptability. e-SCs also require more enabled-technology than their traditional supply chain counterparts. As a result, performance drivers of traditional supply chains are no longer appropriate when explaining e-SC performance. Also, business via the internet requires different fulfillment approaches, making traditional drivers of regular supply chains no longer adequate for explaining how and to what extent e-SC performance is driven (Sambasivan et al., 2009).

A dramatic revision of current SCM techniques is needed (Caputo et al., 2004). Based on the framework suggested by Caputo et al. (2004), this article introduced three e-SC performance drivers: the adapted organizational structure for effectively managing many-to-many relationship types among network partners, the managerial criteria, and the e-SC critical activities. Enabled-technology employed by e-SCs are specific ESs such as ERP. ERPs are the third generation of ESs that began with MRP and MRP II. Effective integration of ERPs into e-SCs can significantly improve responsiveness and yield a high return on investment. Understanding drivers of e-SCs helps managers to better structure drivers to achieve their desired level of service at a minimal cost while increasing customer satisfaction and competitive advantage. In the e-commerce environment, e-SCM is one of the most important factors to organizational success. Effective e-SCM can enhance competitiveness and increase market share, leading to a higher profitability. Nevertheless, the new e-SCM professionals and other key players involved must understand the factors that undergird e-SCM performance, their drivers, and the necessity of fully functional ERPs for an effective e-SCM.

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## APPENDIX A: KEY TERMS AND DEFINITIONS

**Logistics:** That part of SCM responsible for moving materials, funds, information, and services from the point of origin to the point of consumption.

**Logistics Capabilities:** Ability to employ logistics capacities to achieve the desired level of responsiveness at the lowest cost possible.

**Logistics Capacities:** Includes physical assets, such as buildings, plants, factories, manufacturing centers, processing centers, distribution centers, warehouses, utilities, human resources, computers, cars, trucks, trains, aircrafts, ships, materials and goods, and supporting information.

**Logistics Protocol:** Sequence in which logistics activities are to be performed according to specific mathematical models.

**Strategy:** Set of actions designed and employed to achieve goals.

**Supply Chain Facilities:** Operating units (such as factories), storage facilities (such as warehouses), processing centers, distribution centers, and even offices since information is manipulated to trigger, move, and track products and services within and throughout the supply chain.

**Supporting Facility:** Supply chain facility necessary before a service can be provided (i.e., hospitals building, classrooms, airplanes, etc.).

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