

VIII. International Winter Conference of Economics PhD Students and Researchers

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Conference Proceedings

**VIII. International Winter Conference of
Economics PhD Students and Researchers**

Conference Proceedings

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The research of end-to-end logistic model and theory development

Fu Yingjie¹ - Tímea Kozma²

Abstract

Today, the supply chain (SC) operation of enterprises has undergone great changes and is still changing, and it is an important topic to study the development theory of modern supply chain (end-to-end supply chain). The main purpose of this paper is to study whether the current end-to-end operation theoretical model meets the current end-to-end supply chain operation requirements. By using the method of literature review, this paper sorts out the characteristics of supply chain models in different periods and divides supply chain models into traditional supply chain models and modern end-to-end supply chain models. The study found that the e-commerce economy has played an important role in the emergence of end-to-end supply chains, but the current end-to-end operating model of supply chains still has limitations.

Keywords: supply chain, end to end, operation management, supply chain KPI, SC operation management metrics

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1. Introduction

Traditional supply chain organizations-or simple functional supply chains were common in the 1950s and 1970s, and the integrated supply chain organization which brewed in the 1980s and formed in the 1990s, while suggesting that end-to-end management is now the new model for supply chain development. However, Supply chain management indicators in the traditional sense tend to focus on one area of the supply chain, which causes the overall supply chain to operate inefficiently. Today's supply chain demand is growing exponentially as companies continue to introduce personalized products and services, seeking to meet consumer demands for accurate on-time, on-location delivery at the original low cost. These differences all show the research necessitation of end-to-end supply chain operation theory.

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2. Theoretical Background of the supply chain model

2.1. Traditional supply chain model

In 1994, the definition of supply chain management was defined by members of ICFCE: “Supply chain management is the integration of business process from end users through original suppliers that provides products, service, and information that add value for the customer.” (Burgess, 1998, pp. 15-23). When it first shows as a literature verb is in middle of the 1980s (Cooper M.C.a, 1997, pp. 1-14). In the literature on supply chains during the years when the definition of supply chains was unclear (1950s-1990s), the development model of supply chains can be broadly categorized from Simple functional supply chain organization to integrated supply chain organization.

Simple functional supply chain: Traditional supply chain organizations-or simple functional supply chains were common in the 1950s and 1970s. Supply chain responsibilities were mainly distributed in the three fields of finance, manufacturing, and marketing (Cooper M.C.a, 1997, pp. 1-14) . With the intensified market competition and the gradual growth of the small-batch and multi-batch model, the original supply chain model gradually became inadequate, so the supply chain is in the distribution and lean production and other fields have gradually begun to develop.

The integrated supply chain: The integrated supply chain organization was brewed in the 1980s and formed in the 1990s. Houlihan mentions the planning and controlling structure, information flow, and organizational culture (Houlihan, 1987, pp. 51-66). It has basically formed the embryonic form of today’s end-to-end supply chain. Most companies separate procurement, manufacturing execution, lean production, and other responsibilities in many cases, and have put forward more classic measurement systems and management theories. However, it is more limited to the production links and inventory management within the enterprise.

2.2. Modern supply chain End to end supply chain model

Then ICFCE wide the definition of the supply chain to global in 2000, the main difference between the definition that they post in 1994 is, they pointed out supply chain management is a management philosophy, Core companies need to work with cooperative companies in the supply chain to achieve common optimization and efficiency goals. (Ronchi, 2018). Today, the challenge for business organizations is how to mitigate risks by creating a more resilient supply chain, under the background of global competition, technological changes, and the constant struggle for competitive advantage, many companies need to transform their supply chains.

The end-to-end supply chain is a holistic view of the supply chain that integrates all supply chain functions. It breaks down the relatively siloed management aspects of the traditional supply chain and avoids the inefficiencies caused by such silos, providing a better customer

experience and process efficiency through visibility into the entire supply chain. (Lu Hongyan, 2019).

2.3. The theoretical model of end-to-end supply chain

In order to achieve end-to-end supply chain management, academia and industry have combined practical developments and cutting-edge information to propose several new supply chain management theories, which will be mentioned below, and which have likewise been enriched and innovated as the end-to-end supply chain has evolved

Supply-Chain Operations Reference-model (SCOR)

SCOR is the product of the Supply-Chain Council (SCC) in 1996, It provides a unique framework that links business processes, metrics, best practices, and technologies into a unified structure to support communication among supply chain partners and improve the effectiveness of supply chain management and related supply chain improvement activities. This model consists of three major entities and five major functions. The three entities are the supplier, the enterprise, and the customer; the five major functions include plan, source, make, deliver, and return. The main two purposes of SCOR: first, to unify supply chain processes and terminology; and second, to establish a relatively complete set of performance measurement indicators. The main functions of the model are: to assess the performance of the supply chain; analyze and optimize it through the entire supply chain of partners; and use the software at the right point and function (G.Poluha, 2007, pp. 1-48). Therefore, many companies also rely on the model to manage, analyze, and optimize their end-to-end supply chains.

DDVN (Demand-Driven Value Network)-Gartner

By the definition from Gartner, “DDVN is a business environment holistically designed to maximize the value of and optimize riskbased on a near-zero-latency demand signal across multiple networks of corporate stakeholders and trading partners.” (Gartner). In recent years, Gartner has promoted DDVN, which divides supply chain maturity into 7 dimensions (strategic management, performance enablement, supply network, full lifecycle management, demand management, order fulfillment, supply management) and 5 stages (reaction, anticipation, integration, collaboration, ecology), and ranks the global supply chain operations of better companies in operations for industry reference.

DDVN is a globally designed business network that, as its definition states, aims to maximize value and minimize risk, but companies in different countries and industries have different perspectives on their own asset utilization, cost optimization, and departmental process efficiency, and many companies have become very fragmented internally and externally. It is a business support strategy that builds on the company's own processes and those of its

upstream and downstream networks to improve integration capabilities and enable optimal supply chain planning and execution. (Jennifer Loveland, 2014)

Sales and Operations Planning, S&OP

The concept of S&OP was systematically described in *Orchestrating Success*, subtitled *Improve Control of Business with Sales & Operation Planning* (Coldrick, A., Ling, D., & Turner, C.W., 2003). Here is the main process of SO&P: Business Leaders, focuses on revenue and goal attainment, Cyclical forecasting and planning, there is a sequence from planning to execution.

3. Materials and Methods

The following research will summarize the main influencing factors of the end-to-end supply chain through the literature research method. The second half is a theoretical comparison study, which will compare the existing supply chain operation management models based on these factors.

3.1. The typical factors of end-to-end supply chain development

The global economy has entered the era of supply chain collaboration, digitalization and wisdom have become the distinctive features of the modern supply chain, the Internet platform has become the new form of modern supply chain development, and supply chain service has become an emerging service industry. IBM proposed three characteristics of an intelligent supply chain: advanced, interconnected, intelligent. This article finds that technology E-commercial and globalization could be the main reasons for this hope, they are not only the characters but also the requirement.

Industry 4.0 and digital

Industry 4.0 is the natural product of the third industrial revolution, which revolutionized the commercial nature of the second half of the 20th century through a series of computerization and IT advances (Dutzler, 2016). Asthana gives these three questions to the technology transformation of the supply chain: Demand uncertainty and the inability to accurately forecast demand, Production uncertainties leading to changes in supply, Lack of synchronization among supply chain partners (Asthana, 2018), which pointed to uncertain demand, uncertain supply, the uncertain partner. And industry 4.0's implementation in the supply chain almost gives the technology basement for these problems. Technological innovation opens possibilities for the development of modern supply chains, and the realization of end-to-end supply chains also requires the application of new technologies.

E-commercial and globalization

Traditional supply chain patterns no longer meet demand: In the context of globalized markets and diversified channels, traditional supply chain firms are struggling to manage profits-supply chain be defined as profit maximization, (Patil, 2015)) and collaborate efficiently. The collective intelligence, capabilities, technology, resources, and scale of most supply chains are no longer sufficient to meet these demands and scale is no longer sufficient to meet these expectations (Mike Burnette, 2019). As the challenges of supply chain globalization, causing exponential growth in complexity is arguably the biggest challenge facing supply chains today; the rapid growth in channels, regulations, and the speed and complexity of new product introductions have all contributed to the proliferation of complexity. In today's highly competitive and uncertain market, the fragility of the supply chain has become an important issue for many organizations.

The traditional theory is difficult to serve the complex supply chain needs: In the consumer goods industry, for example, 17 percent of new products were introduced in 2006 - twice as many as in 2005 - and product mix rationalization is eliminating SKUs at the same rate (IBM, 2018). In inventory management, Economic Order Quantity (EOQ) is one of the most classic production planning and inventory management models. This model was first proposed by Ford Harris in 1913. But Mark said that the EOQ model might be outdated in today's background: In the context of e-commerce, as customer demand has been changing, this has led to the constant change of holding costs. Suppliers will offer discounts during large-scale purchases, which overturns the assumption that unit purchases remain unchanged (Mark, 2021).

4. The comparison analysis of the supply chain theory

This comparison is mainly made from the application of technology brought by Industry 4.0, e-commerce, and globalization. Among them, the more important basic points are divided for detailed measurement, and then the differences between these three concepts are analyzed. Table 1 this the comparison structure made by the author, it includes three main parts from the typical factors of end-to-end supply chain development research from the above chapter and several detail characters of the factors:

Table 1. The comparison structure of the three theories

Measuring and solving end-to-end problems by SO&P		
Industry 4.0 and digital	E-commercial and globalization	Overall SC assessment
Information interaction (linkage of hardware and software)	Product diversification (related to procurement, production)	Evaluate overall supply chain operations regardless of details
Information sharing (suppleness of SC links)	Diversification of distribution channels (related to warehousing, logistics)	
Information forecasting (Responsiveness of the SC)	Supply chain services (related to order closing, Reverse logistics-related)	

Table 2. SCOR metrics in E-commercial and globalization aspect

E-commercial and globalization		
Product diversification	Diversification of distribution channels	Supply chain services
Supplier's/Customer's/ Total Supply Chain	transfer Product Cycle Time Delivery Cycle Time Build Loads Cycle Time	Delivery Item Accuracy Delivery Quantity Accuracy Delivery Performance to
Release Finished Product to Deliver Cycle Time Activities Cycle Time	Select Carriers & Rate Checkout Cycle Time	Supplier's/Customer's/ Total Supply Chain Management

Source: SCOR (2013), Introducing the Five-Stage Demand-Driven Maturity Model for Supply Chain Leaders, For SCOR, there are no metrics related to industry 4.0 and digital, only the metrics related to E-commercial and globalization such as Table 2. In the field of Overall supply chain assessment, SCOR show a better evaluation metrics (SCOR, 2013): Delivery Performance/Fill Rates/Perfect Order Fulfilment.....Order Fulfilment Lead Times/Supply Chain Response Time/Production Cash-to-Cash Cycle Time/Inventory Days of Supply.

The DDVN model is based on the company's internal self-assessment of supply chain improvement and classifies companies into five types according to their different states: react/anticipate/integrate/collaborate/orchestrate. According to the pain points of supply chain development of different types of companies which appear in the introduction of DDVN theory, the current stage of the company is enhanced through the five aspects of outcome/metrics/process focus/technology/organization (Noha Tohamy, 2013).

Table 3 shows what SO&P metrics are used in the current end-to-end supply chain, in Industry 4.0 and digital aspects there is no metric found to measure the performance. and for E-commercial and globalization parts there is no case showing that medically based on Product

diversification, Diversification of distribution, Supply chain services. These metrics are more a measure of whether the process in this segment is working perfectly, focusing on the process rather than the supply chain itself.

Table 3. Measuring and solving end-to-end problems by SO&P

Measuring and solving end-to-end problems by SO&P	
Industry 4.0 and digital	NONE
E-commercial and globalization	Orders loaded within Leadtime Number of demand changes in the period Supplier on time in full % Capacity utilization Inventory Unallocated stock
overall supply chain assessment	order on-time delivery rate, production plan accuracy rate, demand forecast accuracy, order completion cycle time, capacity planning, and actual comparison.

Source: Overall supply chain assessment: [Jesse Kelber](#) (2019), 5 KEY S&OP METRICS TO TRACK IN 2021, E-commercial and globalization: blog (supply chain-mechanic), Which S&OP Metrics to use? Improving SIOP – 5 key actions to help your S&OP process,

5. Conclusion

The comparison of these three theories shows that all three theories have measures for supply chain operations, but these three theories do not explore the degree of integration of Industry 4.0 digital and supply chain. Moreover, the indicators of these theories are more from the supply chain subject to monitor the indicators and focus on how to assess the overall completion of the supply chain, rather than detailed to each specific link. In addition, the indicators do not reflect the indicators from the perspective of e-commerce and globalization, which are external to the main body of the supply chain, and how the main body in the supply chain should face the three new consumer demands: Product diversification, Diversification of distribution channels, and Supply chain services.

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