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Stephen A. LeMay

The University of West Florida, slemay@uwf.edu

Dave McMahon

Pepperdine University, dave.mcmahon@pepperdine.edu

Jeffery A. Periatt

Auburn University, Montgomery

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Stephen A. LeMay

The University of West Florida

Dave McMahon

Pepperdine University

Jeffery A. Periatt

Auburn University Montgomery

ABSTRACT

Supply chain management remains a young field, one that has struggled to define itself in the most literal sense. This research looks at some of the most available definitions of supply chain management, analyzes their content, and explains the essence of the definitional problem. It does not attempt to define supply chain management--that would be a bit like driving onto a crowded road while complaining about the traffic--but it does attempt to lay out the path or paths that need to be followed to arrive at a consensus definition.

INTRODUCTION

Many business disciplines have struggled to find a firm, theoretical foundation. It is unquestionably a challenge, especially since most of these disciplines, at least as academic pursuits, are youthful. The oldest is probably economics, which laid a mathematical foundation in the 20th Century and is now in the process of undoing much of that with the application of behavioral concepts and experimental techniques. Marketing went through a stage of ‘Is Marketing a Science?’—not really an existential struggle, but one of identity. Is marketing a ‘real’ science or merely a social science? Is economics a science like physics, or merely a social science?

Key members of these disciplines have struggled to answer these questions, often in different form, over the last 50 years. Marketing has seemingly surrendered to the notion that it is a social science at best, and economics is still trying to put a mathematical spin on the idea that the error factors in its key mathematical models are predictable when subjected to the methods of psychology. The struggle continues.

And this brings us to the principal discipline in our discussion: supply chain management. Is supply chain management a science? Is there a unified theory of supply chain management? More importantly, can there be a theory of supply chain management? And last, should there be a theory of supply chain management?

We will start with unequivocal answers to these questions, and then proceed to explain our analysis and our reasoning. So: no, no, no, and no. The answer to the first is simple: the field does not even have a unifying definition, so how could it possibly be science? The second is equally simple: a discipline cannot have a unified theory if it lacks a unifying definition. The third is not quite as simple, but the short answer is this: a discipline is not a science simply because it uses tools developed by science. The final question is more problematic, but the current answer is still sound: the normative question cannot be answered until some of the practical questions have been answered. At this point, it would take a scientific revolution of Kahnian proportion to say ‘yes’ to any of these questions.

We will not undertake detailed answers to all of these questions in this work. Rather we will focus on the one thing that changing the answers to these questions would require: a widely accepted definition of supply chain management. We begin with an analysis of the definitions of supply chain management, then discuss the implications of that analysis for the answers to each of the questions that we have posed. We acknowledge up front that this discussion is something of a preemptive strike. We do not wish to see navel gazing articles about supply chain management, at least not until we have figured out what it is.

DEFINITIONS OF SUPPLY CHAIN MANAGEMENT: A SHORT LITERATURE REVIEW

Our aim in this literature review was to identify the most readily available and most commonly cited definitions of supply chain management. Several important researchers have sought to codify the definition of supply chain management, wading through the problem in systematic ways. The most important of these was probably Gibson, Mentzer, and Cook (2005). These researchers surveyed the membership of the Council of Supply Chain Management Professionals to get their views on two definitions of supply chain management, among other things. These two definitions are both included in our analysis. They also argued that it was no surprise that SCM was struggling to define itself since the discipline is so young (Gibson, et al. 2005). We also looked at other definitions promulgated either by major SCM programs, widely recognized organizations, and widely cited authors. These included the CSCMP, APICS, the Supply Chain Council, the University of Tennessee, Michigan State University, and others. In all, we analyzed 27 definitions of SCM. Many of these definitions were collected in two sources, “Supply Chain Management Definitions.” 2011. *Careers in Supply Chain Management*. Council of Supply Chain Management Professionals and “Private Sector Definitions of Supply Chain Management.” 2015. Defense Acquisition University.

In the table, we abbreviate these sources as “SCM Careers” and “DAU,” along with information about the original sources. We also included definitions from online dictionaries like Wikipedia, Business Dictionary.com, and Investopedia.com. The intention was to identify the definitions of SCM that a search was most likely to produce, along with those most readily recognized and cited in academic literature. We show all 28 definitions and their sources in Table 1.

TABLE 1
Supply Chain Management Definitions

Source/Article	Definition
1. <i>Wikipedia</i>	Supply chain management is the management of the flow of goods. It includes the movement and storage of raw materials, work-in-process inventory, and finished goods from point of origin to point of consumption.
2. <i>Dr. Robert Handfield, Director, SCRC</i>	Supply chain management is the active management of supply chain activities to maximize customer value and achieve a sustainable competitive advantage.
3. <i>Investopedia</i>	Supply chain management is the streamlining of a business' supply-side activities to maximize customer value and to gain a competitive advantage in the marketplace.
4. <i>Michigan State University College of Business (SCM Careers)</i>	Supply Chain Management is an integrated approach to planning, implementing and controlling the flow of information, materials and services from raw material and component suppliers through the manufacturing of the finished product for ultimate distribution to the end customer.
5. <i>SearchManufacturingERP.com</i>	Supply chain management is the oversight of materials, information, and finances as they move in a process from supplier to manufacturer to wholesaler to retailer to consumer.
6. <i>Business Dictionary</i>	Management of material and information flow in a supply chain to provide the highest degree of customer satisfaction at the lowest possible cost.
7. <i>Council of Supply Chain Management Professionals (SCM Careers)</i>	Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities including coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers.
8. <i>Wailgum & Worthen, CIO.com (DAU)</i>	Supply chain management is the combination of art and science that goes into improving the way your company finds the raw components it needs to make a product or service and deliver it to customers.
9. <i>Douglas M.</i>	Supply chain management is the integration of key business

<i>Lambert, Martha C. Cooper, and Janus D. Pagh, (1998).</i>	processes from end user through original suppliers that provide products, services, and information that add value for customers and other stakeholders.
10. Martin Christopher, (DAU)	The management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole.
11. Ohio State University Global Supply Chain Forum (SCM Careers)	Supply chain management is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders.
12. Supply Chain Council (DAU)	The supply-chain encompasses every effort involved in producing and delivering a final product or service, from the supplier's supplier to the customer's customer. Supply-chain management includes managing supply and demand, sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, and delivery to the customer.
13. University of Tennessee Supply Chain Research Group (SCM Careers)	The systematic, strategic coordination of the traditional business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.
14. Webopedia	Supply chain management is the control of the supply chain as a process from supplier to manufacturer to wholesaler to retailer to consumer.
15. Anderson, Britt, and Favre 1997 (DAU)	"A supply chain consists of organizations involved in management of the flow of products, services, and information. The supply chain includes all the links involved in managing the flow of products, services, and information from their supplier's suppliers to their customer's customers."

<p>16. Chopra and Meindl</p>	<p>"A supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer request. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves. Within each organization, such as a manufacturer, the supply chain includes all functions involved in receiving and filling a customer request. These functions include, but are not limited to, new product development, marketing, operations, distribution, finance, and customer service."</p>
<p>17. Mentzer (DAU)</p>	<p>"A basic supply chain consists of a company, an immediate supplier, and an immediate customer directly linked by one or more of the upstream and downstream flow of products, services, finances, and information. An ultimate supply chain includes all the companies involved in all the upstream and downstream flow of products, services, finances, and information from the initial supplier to the ultimate customer."</p>
<p>18. Sunil Chopra (DAU)</p>	<p>"The primary purpose for the existence of any supply chain is to satisfy customer needs."</p>
<p>19. (DAU)</p>	<p>Supply chain management is a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize system wide costs while satisfying service level requirements</p>
<p>20. CIPS</p>	<p>Supply chain management may be thought of as the management of all activities aimed at satisfying the end consumer; as such it covers almost all activity within the organization</p>
<p>21. CIPS</p>	<p>"The selection and linking of suppliers and customers through negotiation and agreement to achieve customer satisfaction by providing value added products and services within beneficial and profitable relationships of all parties within the supply chain."</p>
<p>22. CIPS</p>	<p>"Supply chain management is the continuous planning, developing, controlling, informing and monitoring of actions within and between supply chain links so that an integrated supply process results which meets overall strategic goals."</p>

23. Institute for Supply Management (DAU)	The design and management of seamless, value-added process across organizational boundaries to meet the real needs of the end customer
24. The Supply Chain Council	Managing supply and demand, sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, and delivery to the customer.
25. Logistics Management Institute	Supply chain management is the management of all processes or functions to satisfy a customer's orders
26. Stock and Boyer, 2009 (DAU)	The management of a network of relationships within a firm and between interdependent organizations and business units consisting of material suppliers, purchasing, production facilities, logistics, marketing, and related systems that facilitate the forward and reverse flow of materials, services, finances and information from the original producer to final customer with the benefits of adding value, maximizing profitability through efficiencies, and achieving customer satisfaction
27. Harland, 1996 (DAU)	Supply chain management (SCM) is the management of a network of interconnected businesses involved in the ultimate provision of product and service packages required by end customers.

THE STRUCTURE OF DEFINITIONS

Definitions can be written many ways, but the quasitechnical approach used by logicians is likely to produce the best foundation for a theory. Such definitions consist of three parts: the definiendum, the copula, and the definiens. The definiendum is the thing to be defined, in this analysis “supply chain management.” The copula is a term that connects the definiendum to the definiens, usually a word like ‘is’ or ‘means.’ The definiens does the defining in two parts, first by placing the definiendum in a category and second by distinguishing it from other things in the assigned category.

In this structure, a definition must meet several standards, some of which are clear, and others that require judgement: 1) have a scope that is neither too broad nor too narrow; 2) include all the cases to which the definiendum points, and only those cases; 3) include the essential elements of the definiendum; 4) avoid circularity; 5) avoid figurative language; 6) be precise; and 7) avoid ambiguity, obscurity, or vacuity (LeMay, Holt, and Shmurr, 2012). We have already applied

some of these criteria to the list of 27 definitions and found them wanting, specifically on criteria 1, 2, and 4. None of the definitions suffers from figurative language, criterion 5, unless you consider the fundamental analogy of the relationships between business organizations as a ‘chain’ to be flawed in itself. These technical details are summarized in Table 2.

Table 2
Definitional Qualifications

<p>Logicians use quasi-technical terms for the parts of a definition. The <i>definiendum</i> is that which is to be defined. The <i>definiens</i> is that which does the defining. They are connected by the <i>copula</i>, often the word ‘is’ or the word ‘means.’</p>
<p>The <i>definiens</i> usually has two parts, a <i>genus</i> and a <i>differentia</i>. The genus puts the definiendum into a class; the differentia distinguishes it from other members of the class.</p>
<p>If the <i>definiens</i> repeats the <i>definiendum</i>, the definition is necessarily true, but empty. Technically, it is a tautology, the equivalent of $A = A$. We learn little from circular or tautologous definitions. Such definitions fail to classify or distinguish the <i>definiendum</i>.</p>
<p>Good definitions: have a scope that is neither too broad nor too narrow; include all the cases to which the definiendum points, and only to those cases; include the essential elements of the definiendum; avoid circularity; avoid figurative language; are precise; and avoid ambiguity, obscurity, or vacuity.</p>
<p>A definition that passes the first test will be neither too broad nor too narrow. A definition that passes the second test will place the definiendum in the mind of the reader. A definition that passes the other tests will be clear.</p>

METHODOLOGY

We analyzed these definitions in two ways. First, we created an analysis file from the 27 definitions. To create the file, we deleted the term itself—supply chain management—from the stem of the definition. For example, if a definition starts with “Supply chain management is,” we removed those three words from the file. We also removed connective words like ‘and’ or ‘of’ as these words that did not affect the definitions themselves. We then went through the file for near synonyms, words that for a definition of this nature mean the same thing—‘customer’ and

'customers,' for example. We then put those words into a single form-'customer' in this case-so that the program produced a single count for the concept contained in multiple definitions.

Once the file was sanitized, we put the file into a program, Tagul, which displays the frequency of words in the file graphically. The graphical results of this analysis are shown in Figure 2.

Figure 1
Word Frequency Graph



The problem with these definitions as a collection jumps from the graphic immediately, and so too from the table: they use the terms being defined in the definition. The most common word in these definitions is 'customer,' which is fine, but the second, third, and fourth most common words are 'supply,' 'chain,' and 'management.' That is not so fine.

That is problem one, and it is the biggest problem for creating useful definitions. In lexicology, a definition that uses its own words is 'empty' or tautological. That is, if we say, in effect, that the definition of 'supply chain management' is 'managing a supply chain,' we learn nothing from the definition.

That leads us to the second manner in which we analyzed the data. The first method dealt with the definitions as a whole. The second deals with them individually, essentially grading them for quality and potential. The obvious first step in this process is to remove the definitions that fail to meet the standard of avoiding tautology. This step alone reduces the number of definitions from 27 to 10. This result comes from applying the rule of tautology rigidly; if the definition includes the word 'management,' it is disqualified on this basis. This may seem a bit prickly if the larger term "supply chain" is defined well, and an issue we will consider again at a later point.

The second step is to identify definitions that define something other than supply chain management; that is, they define a qualified version of supply chain management, rather than the thing itself. A good definition of 'supply chain management' should differ from a definition of 'supply chain management done well.' Put another way, supply chain management should be something that firm can do well, adequately, or poorly. If the definition qualifies the concept, then it is too narrow. Usually, in these cases, the definition covers 'good supply chain management,' rather than merely supply chain management. Eliminating definitions for violating this rule brings the number of definitions down to four.

The third step is to identify definitions that are conceptually too broad or too narrow. A definition should include the things that fall into the purview of the thing itself, but also that the definition exclude those things that do not. This becomes a problem for the definition of a business concept or function when it allows the concept or function to 'take over the world,' covering actions or entities beyond its realm, or when it becomes so narrow as to cover nothing of consequence. In that light, we looked at the four remaining definitions.

Mentzer's definition, number 17 on the list, covers the analogous notion of a chain of organizations without using the word 'chain,' covers the flow of goods, services, money, and information; it avoids tautology and qualifiers. It covers logistics between organizations, but does not try to capture marketing, finance, or human resources. It seems a good definition of a material supply chain, with the word 'services' tossed in for good measure. Number 18, from Chopra, does not really attempt to define supply chain management; rather, it offers a purpose for supply chains, but nothing else. For that reason, it should be set aside as either too narrow, focusing only on purpose, or too vague because it is otherwise empty.

Number 16, from Chopra and Meindl, leaves off tautology and qualifiers, but it attempts to incorporate finance, new product development, marketing, and other business functions. It, in effect, tries to let supply chain management take over the organization. That hardly qualifies as a definition of a supply chain; it reaches too far when it argues for the inclusion of 'all parties involved, directly or indirectly, in fulfilling a customer request' and the internal functions that 'include, but are not limited to, new product development, marketing, operations, distribution,

finance, and customer service.’ This definition takes over the organization and everything in it, making it far too broad.

Number 5 qualifies in every respect that we have used so far: it avoids tautology, qualifiers, and limits its scope. However, it covers physical goods, not services. The same critique applies to number 4, the Michigan State definition. To summarize, seventeen of the definitions were eliminated as tautological, six were eliminated because they contained qualifiers, and one was eliminated for the ‘Pinky and the Brain’ effect of trying to take over the world.

RESULTS

This process leaves us with three definitions, shown in Table 3. The problem with this result is that these definitions are not themselves consistent with one another. Also, two of them are limited to the movement of physical goods, while one includes the word ‘services.’ None seem adequate as a foundation for theoretics, but at least these do not violate the fundamental notions of definition. These definitions not only identify what is a supply chain, but also help to identify what is not a supply chain.

Table 3
Post Test Possible Definitions

Source	Definition
Michigan State University	Supply Chain Management is an integrated approach to planning, implementing and controlling the flow of information, materials and services from raw material and component suppliers through the manufacturing of the finished product for ultimate distribution to the end customer.
SearchManufacturingERP.com	Supply chain management is the oversight of materials, information, and finances as they move in a process from supplier to manufacturer to wholesaler to retailer to consumer.
Mentzer DAU	"A basic supply chain consists of a company, an immediate supplier, and an immediate customer directly linked by one or more of the upstream and downstream flow of products, services, finances, and information. An ultimate supply chain includes all the companies involved in all the upstream and downstream flow of products, services, finances, and information from the initial supplier to the ultimate customer."

RESEARCH IMPLICATIONS AND CONCLUSIONS

This analysis was not intended to produce a new definition of SCM. That would be like pulling a vehicle into a traffic jam and complaining about all the cars. However, this analysis does underscore the need for a concerted effort on the part of key players in industry and academia to come up with a definition of supply chain management that resonates with a majority and that supports the development of theory, applications, and programs that lead people into the field, and that help focus research in the field.

So the answer to the four questions asked at the outset of this paper remain no, no, no, and no. At this point, there is nothing theoretical to discuss because a field simply cannot have a worthwhile theory if it cannot be reliably identified.

Before SCM adopts a consensus definition, it needs to assure that the candidates for that consensus meet the minimum standards of a good definition. Once adopted, that definition will need advocates and a full-fledged marketing campaign to support it. The definitions in this analysis were by no means all inclusive—there are more out there. But these are the definitions most likely to be encountered in a textbook or an online search. That means, for the sake of the field, that they need quite simply to be better.

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