A service typology concept model: a literature review

Lingyu Gao [a] and Xiaoli Wang

School of Economics & Management, Tongji University, Shanghai, China.

[a]1510349@tongji.edu.cn

Abstract

The service supply chain management has called much attention in both practitioners and academics. But the classification of service supply chains is still unexplored. Recognizing the heterogeneity of services, this paper aims to clarify the service supply chains in different types. According to the co-citation analysis by using the CiteSpace, which is based on bibliographic data downloaded from Web of Science, this paper develops a three-dimensional typology matrix, representing main clusters of services. The new typology focuses on the service process that is based on three process-related criteria: (a) Input, the degree of input standardization of the customers' participation, (b) Output, the degree of the process flexibility and complex (c) the service degree types for equipment based or people based. On this matrix, this paper develops a typology conceptual model matching the characteristics of supply chains clusters of services that separated by the CiteSpace before. The classification can help managers of service firms to better optimize their service operations for different types of service so that they can reduce service gaps and potentially secure new value-adding opportunities.

Keywords

service supply chain; Cluster analysis; CiteSpace; three-dimensional conceptual model.

1. Introduction

In recent supply chain management (SCM) research, services have become extremely important in the world. And the service economy has been the driving force of economic growth(Giannakis, 2011a). Indeed, the transformation of industrialized economy from a manufacturing based one to service is a continuing phenomenon (Sengupta, Heiser, & Cook, 2006). However, despite the increasing servicization of the world economy, services are still lagging behind in SCM when compared to manufacturing. One of the reasons is that service industry can get benefit by applying some best practices from manufacturing industry, the differences between service and manufacturing could create the specific service supply chain(SSC) performance reflecting the service supply chain practices. (Ellram, Tate, & Billington, 2004).Another reason may be the effective SCM can lead to a lowering of the total amount of resources required to provide the necessary level of service to a specific segment and improved service through increased product availability and reduced order cycle time while reducing costs (Sawik, 2015). From both the practical and academic standpoints, the emphasis in SCM is still strongly skewed towards the manufacturing sector(Giannakis, 2011a) Thus, there has been little research to date on service supply chain ,let alone the classification of the service supply chains. For this reason, it is necessary for researchers to measure the service supply chain classification(Cho, Lee, Ahn, & Hwang, 2012).

Services are difficult to visualize and manage, for they are diverse in nature and have high heterogeneity. Contextual and service procurement is not done in a centralized fashion. Management researchers make use of increasing computer techniques to analyze large datasets of publications and citations in order to characterize the structure of scientific fields, find the crucial phase transition and their trend over time(Sasaki, Kunigami, Yoshikawa, & Terano, 2014) even to model the scientific

theory and identify characteristics of process patterns. (Mustafee, Katsaliaki, & Fishwick, 2014). By analyzing citation data, we can define and classify the field.

CiteSpace is a Java application which is designed to answer questions about a specific knowledge domain, and broadly defined concept that covers a scientific field, a research area, or a scientific discipline. A knowledge domain is typically represented by a set of bibliographic records of relevant publications.(Zhigao Liu, Yin, Liu, & Dunford, 2015) Citation analysis and other bibliometric methods are fully fledged systems that applied to the study of science fields today (Rorissa & Yuan, 2012). CiteSpace uses progressive co-citation network analysis to identify the intellectual structure by focusing on nodes that play critical roles in the network and formed groupings by accumulating co-citation trails in scientific literature.(Xie, 2015)(Levent Yilmaz, 2015). CiteSpace can characterize the co-citation cluster by citation the bustiness in terms of the salient noun phrases that extracted from titles, abstracts, and index terms to summarizations of clusters.(X. Zhang, Wang, de Pablos, Tang, & Yan, 2015) In scientometric review, CiteSpace is used to depict the turning point of articles and authors, address the center research, active disciplines, categories(Fang, 2015)

It is important to highlight the classification of SSC. Although some researches have been conducted to explore the differences of SSC but they haven't made classifications nor implications for practicing supply chain management. To address this gap, this paper analyzes SSC in three demonstrations:

(a)Input dimension: customer participation level that affects the service in the service supply chain.

(b)Output dimension: output tangibility/intangibility for process flexibility level.

(c)Service level: manufacturing equipment based or the employee skills based

The remainder of the paper is organized in five sections.

In the first section, the usefulness and necessity of viewing services as part of supply chains are discussed, the concept model is presented and the peculiarity of service performance is analyzed. In the second section the research design and analytical approach are adopted to develop the framework and its features are presented in detail. The third section is about data collection and presents the data analysis. In the fourth section a three-dimensional typology is propose and the three dimensions of the model that performance metrics for services supply chains can be adapted to assist its utilization. The paper concludes with a supply discussion of the theoretical and managerial implications of the framework, and ends with its limitations and extension of the research.

2. The Literature review

2.1 Service Supply Chain

Supply chain is well known as a network of entities production and delivery of goods and services that starts with the suppliers' supply and ends with the customers' satisfaction. And its origins can be traced to operation management, logistics, by necessity, requires a wider, trans disciplinary approach. As (Croom, Romano, & Giannakis, 2000) pointed out in their literature review, a 'confusing profusion' that service is a part of the SCM exists in the supply chain management literature. Therefore we begin with a definition of service supply chain management (Ellram, Tate, Billington, & Ellram, L. M., Tate, W. L., & Billington, 2004)

Service supply chain management is the management of information, service performance, processes, capacity, funds, and forward and reverse flows of tangible goods from the earliest supplier to the ultimate end customer, including the return and/or disposal of any tangible goods purchased. In this definition there is only tangible good but previous research focuses on services offering intangible product (output) bundles capturing the position at the end of the continuum (Giannakis, 2011b). (Sampson, 2000) argued that services are not solely intangible but their provision can be seen on facilitating goods. According to(Sawik, 2015), service products can be viewed as bundles of goods and services, and most services are in between. Services, depending on their position on the continuum, will possess different operational characteristics. Hence, a classification model is needed for better understanding of service supply chains.(Yulan Wang, Wallace, Shen, & Choi, 2015)

A more accurate term for the concept of a service supply chain might be a service supply network (compared with the more traditional linear value chain), which better aligns with (Walters & Lancaster, 2000) concept of value constellation. For the remainder of the paper, we thus use the terms 'services,' 'service supply chains,' and 'service supply networks' interchangeably.

2.2 Introduction Of Citespace Software

The theory for Modeling and Simulation International is a technical theory that is devoted to the further field of Modeling and Simulation (M&S) (Mustafee et al., 2014)It has widely disseminated the advancements in this field through peer-reviewed journal conferences and magazine publications. In the year 2012, those scientists and engineers would be to perform a form of content analysis that would seek to identify important publications of theory and directions that have made significant contributions to the field of M&S. (Yilmaz, 2010)

In our research we use the knowledge domain visualization software CiteSpace (McKerlich, Ives, & McGreal, 2013). CiteSpace identifies points associated with articles from citation data. In order to identify significant papers we should analyze cited articles, cited authors and cited journals, (J. W. Liu & Huang, 2008)authors and journals irrespective of their citation count. This is achieved through the use of full feature set of CiteSpace, including visual identifications of significant articles, authors or journals through innovative visualization techniques (X. Zhang et al., 2015) The use of CiteSpace requires a careful selection of multitude of options, and an acceptation of options' combination, frequently requires knowledge of the underlying research domain.

The use of this underlying data set to conduct two forms of analyses, namely, a profiling study and a co-citation study, to realize the following objectives in pursuance of furthering knowledge on the scope and the breadth of the scholarly field. To determine the most commonly used M&S approaches and techniques. To identify the broad areas/sectors associated with the application of M&S. To identify the specific fields (within the aforementioned areas/sectors) where the application of M&S is widespread.

2.3 The Classification Of The Cluster

According to (Ojala, Pietikäinen, & Harwood, 1996), "to classify things is to know a key attributes about an object and then infer (sometimes reliably, sometimes not so reliably) other attributes of the object." Researchers that propose typologies implicitly organizations are neither different nor completely like other firms. The utility of service classification ultimately lies in their ability to facilitate the development of strategies and their guidelines for service marketing and managers' operations. Snyder, (Rhian Silvestro, 2009)claim that because of the criteria and parameters are ambiguous, some service classification schemes are useless. Furthermore, the existence of multiple definitions for service and the service sector increases potential confusion when considering the service literature. This poses a challenge for managers and researchers to evaluate the merits of current classification schemes.

The modeling approach is driven by the nature of the inputs and outputs of the objective. The four categories are: (a) deterministic analytical models, when the variables are known and specified, (b) simulation models (c) stochastic analytical models, when one parameter is unknown, and others variables are assumed to follow a particular probability distribution, (d) economic models.(Beamon, 1998)

Several typologists have previously attempted to categorize services in a comprehensive review and the key classification criteria, including (a) customer contact, (b) service intensity (people based or equipment based), (c) customer participation, (d) production processes. The focus is on a classification scheme that facilitates the analysis of service supply chain processes and strategy. (Stavrulaki & Davis, 2014)

3. Data collection Methodology and analysis

3.1 Data Collection

The search was performed in databases of Web of Science namely SCI- EXPANDED, SSCI, A&HCI, CPCI-S for 20 years. For the sake of analysis, bibliographic records from SCI include information such as titles, abstracts, authors as well as references. The addition of cited references resulted in a total of 32,576 nodes. The data used in this article are retrieval strategy in the present paper is the following:

Topics = service supply chain

Refined by: Document Type=ARTICLE

Timespan=1996 to 2016 Years

Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, and CPCI-SSH.

Lemmatization = On The full bibliographic records including authors, titles, abstracts, and reference lists for 3,635 articles were retrieved and downloaded in June 2016. CiteSpace III was used to generate co-citation networks.

3.2 Methodology

This research used analytical approaches co-citation method. CiteSpace III was used to analyze and visualize co-citation networks. In the networks the nodes normally represent countries, authors, institution journals, key words and so on; while links between these nodes represent co-citation or co-occurrence. Large node in co-citation map means higher citation and larger impact. (Xie, 2015) Citespace's co-citation or co-occurrence analyses can be applied to different factors, such as cited author, cited reference, cited journal, co-word, and so on. The valuable information can be drawn by studying these clusters and the relationships between these clusters in visual maps.

Scientific literature contains persistent and transient elements. The transient aspect can be characterized by corresponding thematic trends, whereas the persistent and salient conceptual structures can be shown in the map. The analysis of the thematic trends is based on the concept of burst detection(Chen, 2005). The highly cited papers provide concrete indicators as a citation bursts. And the salient conceptual structures also can be identified by clustering analysis.

The thematic trends and conceptual structures can improve our understanding of the hot topics, the length of a particular thematic trend, and the variety of topics fit on global intellectual picture. Though the document co-citation network we traced is the high burst cited references, but the focus of domain changes over time in the SSC field. We also identified the perspective of SSC along the clustering analysis.(Small, Boyack, & Klavans, 2014)

3.3 Data Analysis

3.3.1 Panorama Of Service Supply Chain Domain

The intellectual landscape of the SSC field can be represented by a network that contains cited references, co-occurring keywords and collaborating authors. The cluster representative concepts can be identified by algorithmically generated labels. The link in co-citation network represents the frequency that two articles are cited together in a dataset. And in this merged network the size of a node is proportional to the number of cited references. The history of SSC is visualized in 'tree ring' of different colors and thickness. The rims of nodes indicate pivotal points of high betweenness centrality.(J. W. Liu & Huang, 2008) When a particular connection was made, a color of link denoted. The more dissimilar links connects to others, the more likely the node is a pivotal one to play. Individual nodes were aggregated into clusters based on their interconnectivity. Seen in the Fig 1 and the top reference articles are list in the Table1.

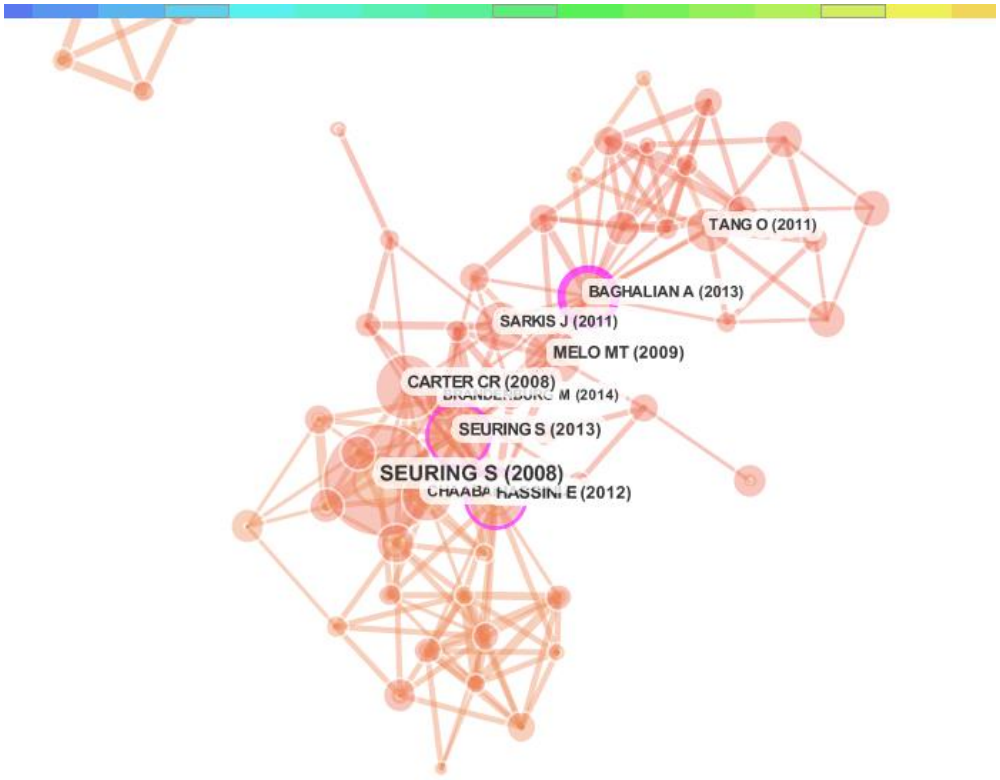

Fig .1 the main reference article in SSC field

Table1. Top reference articles

freq	Author	Year	Source	Vol	Page	ClusterID
27	Baltacioglu T	2007	SERV IND J	V27	P105	2
24	Billington C	2004	JSUPPLY CHAIN MANAG	V40	P17	2
20	Sampson SE	2006	PROD OPER MANAG	V15	P329	2
15	Ellrarn LM	2007	CALIF MANAGE REV	V49	P44	2
13	Sengupta K	2006	J SUPPLY CHAIN MANAG	V42	P4	2
13	Vargo SL	2008	J ACAD MARKET SCI	V36	P1	1
12	Akkermans H	2003	PROD OPER MANAG	V12	P204	5
12	Vargo SL	2004	J MARKETING	V68	P1	9
9	Sampson SE	2012	J SUPPLY CHAIN MANAG	V48	P30	1
9	Vargo Stephen L	2004	J SERV RES-US	V6	P324	2
9	Chen IJ	2004	J OPER MANAG	V22	P119	5
9	Giannakis M	2011	SUPPLY CHAIN MANAG	V16	P346	1
9	Spring M	2009	INT J OPER PROD MAN	V29	P444	1
9	Srivastava SK	2007	INT J MANAG REV	V9	P53	17
9	Baines TS	2007	P I MECH ENG B-J ENG	V221	P1543	1
8	Seuring S	2008	J CLEAN PROD	V16	P1699	17
8	Kim SH	2007	MANAGE SCI	V53	P1843	3
8	Lusch RF	2010	J ACAD MARKET SCI	V38	P19	3
8	Lusch RF	2007	J RETAILING	V83	P5	9
8	Mentzer J T	2001	J BUSINESS LOGISTICS	V22	P1	6
8	Lee HL	1997	MANAGE SCI	V43	P546	0
8	Handfield RB	1999	INTRO SUPPLY CHAIN M	V24	P25	35
8	Selviaridis K	2007	International Journalof Logistics Management	V18	P125	3

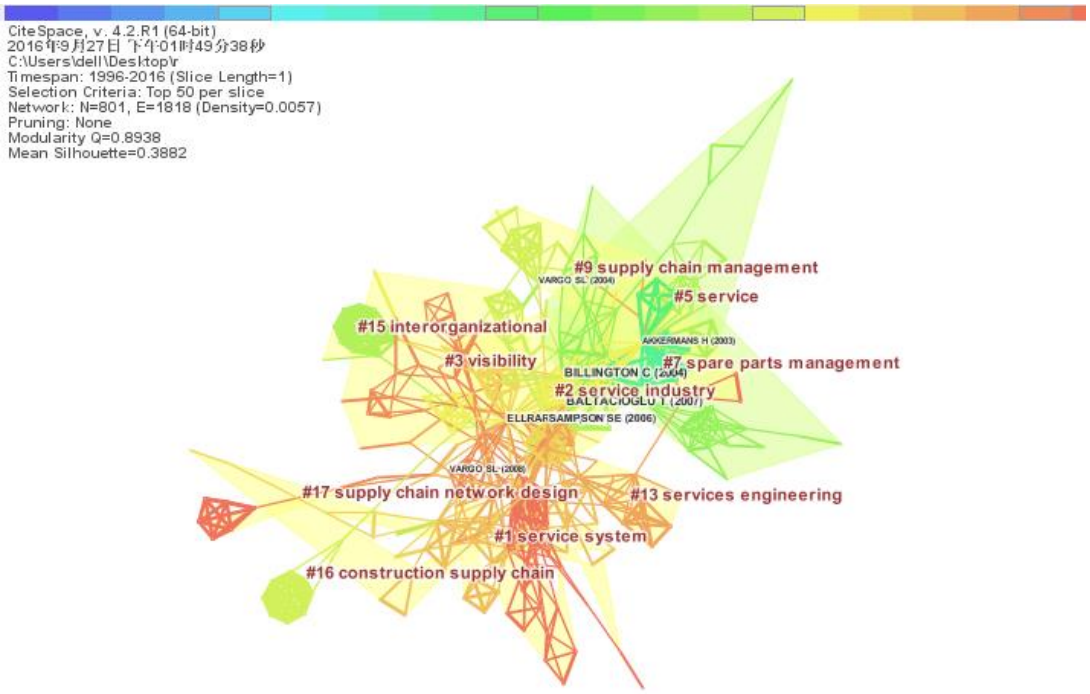

Fig .2 Panorama of service supply chain

In the cluster analysis, the red labels were extracted from keywords and abstracts of articles. Each cluster is a tight group of coupled references that include the base of a research specialty(Zhigao Liu et al., 2015). The homogeneity of clusters is measured from -1 to 1 by a silhouette score. The value 1 means a perfect separation from other clusters. The overall quality division is measured by modularity Q, which ranges from 0 to 1. A low modularity means a network that cannot be reduced to cluster by clear boundaries, whereas high modularity imply a well-structured network.(Fang, 2015) The table 2 and show the clusters' names. In Citespace, we selected top 50 cited references per year, imported the dataset of SSC retrieved from Web of Science, performed Minimum spinning tree algorithm and finally made a co-citation cluster network N=801, E=1818. The overview of a document co-citation network of SSC domain clusters was presented in Fig 2. And the time viewer was shown in the Fig3.

Fig .3 Timeline view of document co-citation analysis of service supply chain

3.3.2 Research Analysis

1. Hot research category and institution

Table 2 shows the categories of service supply chains researches focus on, and the publishing numbers are more than 300. The category findings cohere with the clustering analysis. SSC is an interdisciplinary subject integrating service science and supply chain. The top five clusters are method; customer co-production services; exploring quality the process model; service strategies; service-oriented reference model design framework. The 'method' cluster includes 78 articles, ranking the first in the table. Optimization methods; multiperiod service design; integrated production are the main contents in this cluster. The second one is customer co-production, which means most about the input of the customers' participation. The mean years is 2009 and there are 75 articles published in the cluster. In the process cluster the flexibility and complexity are the questions that are talked most in the 39 papers.

Cited frequency over 1000 journals and top two centrality journals reveal that customer co-production cluster is the central research theme of service supply chain. This result agrees with that of category detected in Table 2. The color of every layer of concentric circle corresponds to the time slice legend displayed in Fig 4.

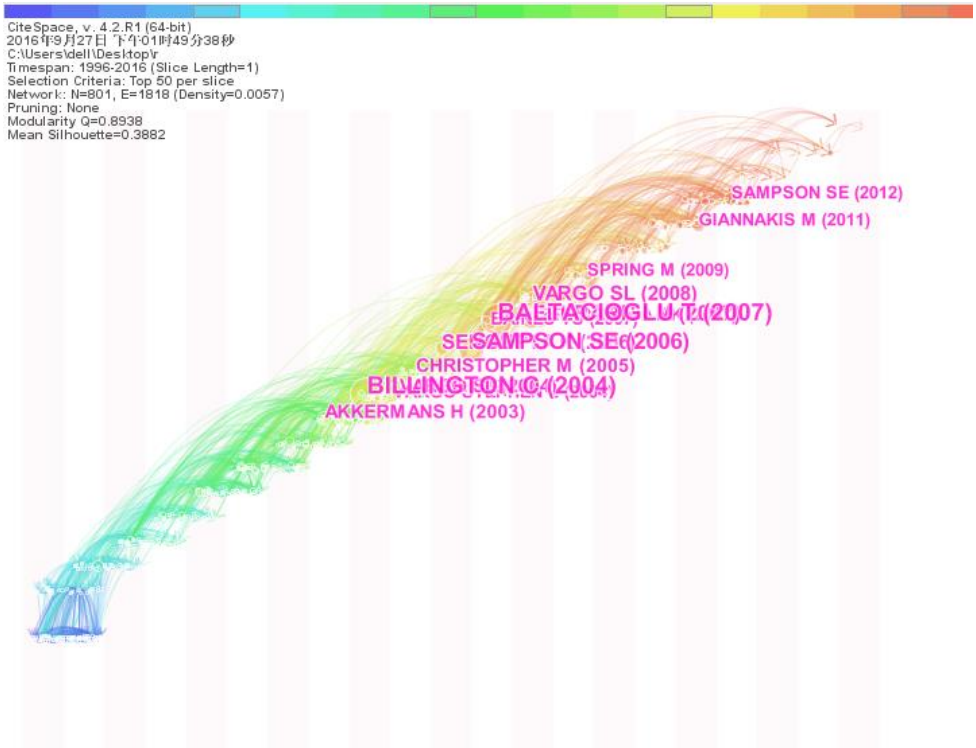

Fig.4 Map of timezone mode of references in SSC field.

Table 2. The clusters' name

Cluster ID	Size	Silhouette	Mean (Year)	Label (TFIDF)	Label (LLR)	Label (MI)
0	8	0.994	1993	methods	operating cost; supply chain forcing firm	manufacturing environment
1	5	0.85	2009	customer co-production services	reverse exchange; resource dependencies reverse flow	critical issue
2	9	0.881	2006	Exploring quality management, process model	service supply chain performance; service supply chain; overall performance	high degree

3	8	0.866	2008	service strategies bibliometric analysis	quality management; buying companies; humanitarian logistics	including service manager
4	8	0.993	1996	teaching supply chain management	supply chain management useful reference; popular supply chain case studies	spare parts supply chain
5	7	0.949	2003	moving consumer goods	service value-chain ; many gap; individual customer	competitive market
6	7	1	2000	manufacturing facility operators	facility operator; demand chain ; critical research area;	customer loyalty
7	6	0.932	2002	manufacturing defense system	emerging avenue; spare parts management; additional research	resulting product families
8	3	1	1998	inventory system drivers	target service level; service-sensitive demand; supply integration	analytical model
9	7	0.97	2006	optimizing product service system theory	logistics service value; logistics context; s-d logic perspective;	in-depth case studies
10	6	0.991	1996	supply chain management in theory and practice: a passing fad or a fundamental change	major issue; integrated relationship; reducing uncertainty;	supply chain
11	6	1	1996	customer service based design of the supply chain	customer service requirement; analytic hierarchy process; cost-based design	supply chain
12	5	1	2002	horizontal collaboration proactive alignment	agri-food supply chain; farm gate; leverage characteristics	theoretical framework
13	3	0.957	2009	collaboration risk evaluation model	systems theory; services system; services science	in-depth case studies
14	2	1	2000	web-based supply chain integration model collaboration	supply chain collaboration ; trading partner; supply chain segmentation approach;	CRM concept
15	2	0.997	2003	monitoring structural cost management	strategic cost management; structural cost management; executional cost management	CRM concept
17	1	0.982	2010	service-oriented reference model design framework	environmental performance; chocolate product; beneficial effect	supply chain
16	1	0.962	2006	web service framework modeling	construction supply chain; construction project sc collaborator	operative level
19	0	1	1997	from mass production to mass customization: impact on integrated supply chains	mass customization; generic supply chain framework; traditional manufacturing processe	supply chain
18	0	1	2001	collaborative order management: toward	exchanging order information; order	business partner

				standard solutions for interorganisational order management	management solution; generic definition	
20	0	1	1999	supply chain management and reverse logistics - integration of reverse logistics processes into supply chain management approaches	supply cycle; various partner; inventory reduction	supply chain
21	9	1	2000	study on sla and slm for strategic partnership among third party logistics service	strategic partnership; slm method; acceptable cost	third party logistics
22	9	1	2008	logistics coordination system disruptive events	logistics supply chain system; original logistics supplier; key business processe	collaborative management
23	8	1	1999	amplification in service supply chains: an exploratory case study from the telecom industry	amplification effect; manufacturing environment; particular service context	service supply chain
25	7	1	2001	database schema design for a web services supply chain manager: requirements and proposed infrastructure	web service; requiring new hybrid organizational infrastructure construct; web service invocation	web service
24	7	1	2004	third-party logistics providers	supply chain participant; 3pls provider; chain participant	supply chain
27	6	1	2011	autonomous freight exchange concept	code24 project; agent-based freight exchange; market place	actual demand
26	6	1	2003	quality assurance: a study of the primary poultry producers' perspective	concerning sample size; second stage; proven mechanism	quality assurance
29	5	1	1998	a multi-agent system architecture for coordination of just-in-time production and distribution	suggested approach; forming cluster; redistribution agent	case study
28	5	1	2001	a web-based system for manufacturing co-ordination in complex supply networks	manufacturing co-ordination; co-operate system; supply network	manufacturing industries
31	5	1	1997	the role of extranets in delivering customer service	operational flow; employing extranet; current empirical study	supply chain management
30	5	1	2001	proactive supply-chain event management with agent technology	supply-chain event management; several mechanism; proactive scem concept ;	logistics service provider

2.Towards relational incomes the customization direction

As mentioned earlier, the clusters present a classification based on a customer perspective(CP) of input. The interaction between customers is a primary input variable in establishing relationship, which has been steadily mentioned in the field of supply chain research(Sampson, 2000). In addition,

interpersonal interactions and the customer emotional state at the encounter are important driving factors to establish interactions, and in relational situations, CP is believed to enhance the essential partnership of knowledge sharing in cooperative development(Ahn & Rho, 2016). More concretely, CP affects employees' emotion and job performance(Jiang, Jun, & Yang, 2015), which in turn encourages employees more efforts to satisfy customers at the service encounter to put in, leading to customer satisfaction through relational value creation(Sampson, Money, Sampson, & Money, 2015). The approach towards CP influences relationship establishment and development indicates that through interactions it can affect customer–service provider relationship at the service encounter. The services that organizations provide are divided into 'people processing' and 'people changing' services, similarly, dichotomies services into doing something for the consumers as individuals and doing something for the consumers' possessions. A related categorization suggested earlier that differentiated between personal (impersonal affecting things and services, affecting the body or the mind).

3. Towards service degree direction

In Service degree it is further classified as equipment-based or people-based. Equipment-based businesses are being treated as automated, monitored relatively skilled operators(Schneeweiss & Schneider, 1999). Likewise, people-based businesses rely on skilled labors, or professionals for their service production. This classification is, from an operations management standpoint, quite interesting since it focuses on the degree of mechanization and of service processes. It also specifically identifies the service workers' skill as an important characteristic of service systems. SSCM implies a strategic orientation towards firm collaboration to integrate network and make its capabilities into a coherent whole(Gilbert & Heinecke, 2014). In other words, firms are process integrators. SSC is also a customer-focused concept aimed at solving the problems and creating customer value(Ojala et al., 1996). While SSCM agrees with the proposed customer focus, it goes even further and sees the role of service supply chains in 'supporting the customers' value creating processes with service offerings, either directly or through goods (M. Zhang, Guo, Hu, & Liu, 2015). Since customers are always co-creators, not just recipients of value, interacting process should be analyzed from a relational instead of a transactional perspective.(Heinonen, Strandvik, & Voima, 2013)

4. The output process flexibility

In the output direction discussion, the classification system is based on the degree of standardization. A distinction is made between projects, standard service custom service. Services are further broken down into those customers participate. In a recent article, (Reiter, Houy, Fettke, & Loos, 2013) suggests that service production should be considered from the angle of process design, and that two vital attributes of service processes are 'complexity' and 'divergence' which means the flexibility of the output process. The focus on processes rather than on organizations or businesses is highly appropriate from an operations analysis aspect.(Watanabe, Mikoshiba, Tateyama, & Shimomura, 2012) The definitions of complexity and divergence are based on the measures that take different steps.

Therefore, service supply chains not only consist of suppliers and buyers of goods, but all the firms that integrate their skills and knowledge in all the upstream and downstream flows of products, services, finances, and information from the ultimate supplier to the ultimate customer.(Bai, Wallace, Li, & Chong, 2014) Hence, they need the co-creation networks. However, the services are most related with the customers and the process. For the above reasons, we make a classification to distinguish the service input of the customization and the output process. The customization is about the information that customers give and the level of the customers' participation.(Riessen, Negenborn, Dekker, & Lodewijks, 2015) Service supply chain is more uncertainty for the customers' participation. On the other hand, the service process is a flexible one as the output of the SSCM is based on the co-created between multiple supply chain resources.

4. A Three-Dimensional Conceptual Model of service supply chains

Offered here is a conceptual model see fig 4 that comprehensively describes three essential aspects of service supply chain management. The three aspects of the model address major questions of concern to academics and managers alike:

Service level, customers-input, and output-process flows are three important aspects in modeling the conceptual model of service supply chains. In this section, a three-dimensional-flow model is proposed.

4.1 The Definition Of The Three-Dimensional Model.

Services are not tangible things that can be seen or touched. Services cannot be entirely divorced from manufactured goods, since almost all services are accompanied by facilitating goods. For example, a surgeon who performs a hip replacement is providing a service to the patient, but that service includes the important facilitating goods, the replacement hip.(Magal, Carr, & Watson, 2005) Similarly, goods are often accompanied by a facilitating service (e.g., having a suit altered when purchased at a store), and an easy dichotomy between manufacturing and service firms does not exist.

Manufactured goods and services are inextricably related, while customers buy products whose core benefit is delivered not by goods or services, but both (Berry and Parasuraman 1991). According to(Edvardsson, 1997) 'There is no such thing as a service industry. There are only industries whose service components are greater or less than those of other industries. Everybody is in service. Thus, we believe no single definition of service can encompass the full diversity of services and the complex processes that accompany them. Therefore, authors have turned to typologies, taxonomies, or classification schemes to more fully address the complexities of services. Although the terms typology, taxonomy, and classification scheme have distinct meanings, they have been used loosely and interchangeably in the literature. Since the purpose of this study is to propose a Three-Dimensional Conceptual Model of service supply chains.

4.2 A Description Of Supply Network Concept Model

The network structure of service flow is described by nodes and their relationships. Services in different degree move through these nodes from upstream to downstream in the vertical directions. Nodes' relationships are connected by services in the fig 2. SSC is a typical discrete event system(Dabholkar & Overby, 2005). The discrete events drive the evolution of supply networks. The events are treated as the start of the whole supply chain.

In the dimension of service flow, the nodes in supply chains can be figuratively described as the discrete points of one axis. And in the dimension of customers' flow, the events received by nodes can also be vividly described as the discrete points of the other axis. Driven by discrete events, the critical level in the horizontal status changes of the nodes is discrete(Yulan Wang et al., 2015). In the dimension of process flow, the process starts when nodes receive the events which can be positioned at the discrete points of another axis. Since service, customers input, and process output flows are discrete, the model path of supply networks is also correspondingly discrete.

A three-dimensional-flow model for service supply chain concept model is qualitatively presented as Fig. 4. In the model, a three-dimensional coordinate determined by input, output, service level, determines a status of the service supply chain.

The reality concept experiment is not viewed as a situation or 'an' orbit or 'a' path in the real system but as 'a kind of' several possible situations, irreversibility, uncertainty and bifurcation of the service trends. Concept experiment tries to reproduce a classification of SSCM realities. Therefore, it is feasible and effective to model the concept model of service supply chain based on the three flows and make use for academic and management decisions.

Beyond this linear understanding, 'ultimate supply chains' comprise all the actors involved in 'all the upstream and downstream flows of products, services, finances, and information from the ultimate supplier to the ultimate customer'(Zhen Liu, Squillante, & Wolf, 2001), highlighting the idea that supply chains are better described as networks of organizations.

As service businesses evolved, they often move along the spectrum from people-based to equipment-based or vice versa, and many companies are in more than one type of service business. Virtually all banks, for example, operate multiple-service businesses. Some of these are equipment-based, as in the transfer and storage of funds. Others are people-based, as in the financing of a home, car, or business, because they require judgment about the financial management of funds.

Thereby, we integrate and structure interdisciplinary research on different types of SSC. So far, many studies have focused on material-flow-related SSC such as logistics services(Lüftenegger, Comuzzi, & Grefen, 2015), specific information-flow-related services track-and-trace solutions , and financial-flow-related services inventory financing in isolation.

A comprehensive literature review covering the complete set of value propositions made by different types of SSC, reflecting customers' diverse service requirements, has not yet been conducted to the best of our knowledge. On the other hand, we classify SSC based on different value co-creation constellations between service providers and customers. Thereby, we answer the question call to apply the concept of value co-creation to supply chain relationships, by far from a neglected but relevant area in SSC research. Previous service classifications focus on either the service customer or the provider. However, since 'S-D logic argues that value can only be created with and determined by the use in the 'consumption' process' at the intersection between service provider and beneficiary(Lusch & Vargo, 2006), an S-D logic-based classification needs to consider both perspectives equally.

4.3 Towards A Service Typology

By linking the three-dimension found commonly in the definitions of service supply chain with the previous service sector typologies, the model reflects the characteristics of key clusters of services pertinent to such supply chains in Figure 2. Later we use this model to develop the structure of service organizations falling within each of the eight service clusters identified.

As shown in Figure 4, the horizontal axis represents the degree of customers' participation of the input; the vertical axis represents the degree of complexity and flexibility of the service output process; eight clusters of services are therefore indicated.

For each cluster, we focus on the main input and output flows within the SSC and then matching the fit degree of the service level.

For the Type I cluster, service output (product bundle) is typically the standardized product line; the process of producing the output relies on customers' input. Typical examples include fast food restaurant, retailing, automobile and grocery stores. Generally, these types of services tend to fit at the end of the manufacturing supply chain. And the service degree is mostly the equipment based level, which is using the transport measure to distribute products from manufacturers to customers. The cluster ID of 0,6,7,28 contain of this type of SSC, the researches include distribution method; manufacturing facility operators; manufacturing defense system; manufacturing co-ordination in complex supply networks.

For the Type II cluster, the process of producing service output is a simple tangible one, but the service input is normally customized. A customized product and process is valued highly by the customer. But the service level is still the basic equipment. Typical example tailor firm shop, house refurbishment. For the Type II cluster, customer requirements are bespoke and vary from case to case and the inputs are deployed based on specific customer requirements. Even the specific exists but the level of the service is still in the manufacturing supply chains, the type II SSC is highly customized and customer-driven. Suppliers to Type II services will normally supply inputs to the service firm, such as parts, components, ingredients and materials. The service firm will then convert these inputs into tangible and intangible service outputs. Unlike Type I services, the input bundle for Type II services is customized element. Based on the data of respondents, although the customized input added the intangible element to the service value, the inputs and outputs are critical for this cluster of services. For this type of service, customer information, personal data and preferences are important intangible inputs. The cluster ID of 1,12,18,19 contain of this type of SSC, the researches include

customer co-production services; horizontal collaboration proactive alignment, branding source supply chain management; collaborative order management: toward standard solutions for interorganizational order management; from mass production to mass customization: impact on integrated supply chains.

For the Type III cluster, service outputs are complex and intangible the process is flexible and the producing service normally relies on standardized inputs. Though the output is complex, the process is in normal steps and does not need more decisions so the service level is the equipment depended. Typical examples include public passenger transport, amusement park and cinema. For this type of service, the outputs are intangible in the form of experience, and aesthetics or recreation. The same standardized resources are dedicated to the different steps in the process. Sometimes maybe limit levels of variation.

For the Type IV cluster, service output is typically intangible and complex as valued by customers, and the process of producing the output relies on customized input is also flexibility one. The service level is equipment based one for the routinization module. Examples include, medical service, barbershop and repair service.

For the above 4 clusters the service level is higher and services are considered as supply chain processes around the capacity of the firm through the upstream sourcing processes. Creation and delivery processes of a management are as an identification to the potential application and benefits of the tool in a service context. The model conceptualizes the capacity of service firms as a resource inventory to build a service offering. And in the situation of the same input and output, high level of the service degree means the service firm's capability is applicable across a wide spectrum of the service sector. An illustration is the value creation of service supply chains. In manufacturing supply chains this is easy to conceive, as it is primarily related with the transformation of raw materials into final products. In the context of services, however, this is no such relevance because they cannot be transformed, transported or inventoried in the same way as industrial goods. Dealerships in the type V; Fashion design, gourmet restaurant in the type VI; broadband service, software designing service in the type VII; and business consultancy in the type VIII, the service level in these types is the management degree practicing from the physical world of manufacturing to the world of services. There is however a pressing requirement for toolkits that will allow service operation managers to model and manage their supply chain processes to improve performance in the design and delivery of services. By emphasizing the co-creation of value through the collaboration of various actors of a service system(Deng, Xia, Zhao, & Li, 2014), the emerging field of service science, management and engineering has provided a new platform for research but until today has focused primarily on the multidisciplinary nature of the design of services. In a world in which customers' perception of service performance has become critical for the success of a company and the ability to manage service level agreements has become notoriously difficult, the development of a robust reference importance. This emanates from the promised benefits that effective SCM can create for all the collaborating parties: reduced costs and increased revenues, improvements in delivery, dependability and service quality. The researches in this level are cluster: 4,13,15,16,17,24. And the context in this level are teaching supply chain management; collaboration risk evaluation model; monitoring structural cost management; web service framework modeling; service-oriented reference model design framework.

5. Conclusion and future research

Prior research has tended to apply manufacturing-oriented frameworks directly or with limited modifications to examining SSC management(Sengupta et al., 2006), hence limiting the opportunity for developing generalizable service-specific theories. The conceptual models presented will help future researchers and practitioners to better clarify the processes of the SSC. Each cluster of service firms can develop better solutions to reduce service gaps, optimize service value chains and enhance the potential for value recapture.

Moreover, the research extends the theory by offering insights into how different SSC constellations have different management implications for firms. First, we highlight that the levels of customization and value co-creation/co-production vary across different SSC. Second, we provide further evidence that no single optimal level of firm collaboration and value co-creation exists(Casielles, Iglesias, & Varela-Neira, 2016). To improve service performance, service providers and customers are required to interact in diverse ways across different types of SSC. Third, our framework highlights that service providers and customers are co-dependent in their attempt to improve the overall service performance and that service customers are required to assume their role as active value co-creators and/or co-producers. Overall, we believe that managers can profit from introducing different service categories to spark internal learning processes concerning how to manage the relationships with their supply chain partners in different SSC constellations in order to improve service performance.(Ellram, Tate, & Billington, 2004)

Further research approaches should take different SSC constellations into account to evaluate how much service customization and value co-production are required for optimal service performance. The directions for future research are: (a) to simplify the three-dimensional-flow model for practical applications; (b) to improve the model by extending flow with considerations of more factors with partial information sharing in a distributed and heterogeneous environment; (c) to study and propose other more effective architectures to support computational experiments for supply network; (d) to conduct more case studies to verify the studied three-dimensional-flow model and its modeling approaches. Prior service classification frameworks have adopted either a service buyer or provider focus. However, according to arguments from SSC, both perspectives need to be integrated to fully capture the relational aspects inherent in service provision(Sieke, Seifert, & Thonemann, 2012). Finally, our study illustrates that service provision has mainly been studied and operationalized at the dyadic level. Therefore, the field of SCM would profit from research that explicitly studies SSC provision and value co-creation beyond the dyadic level. Such studies might also consider the derivation of new research constructs that help to understand and evaluate value co-creation and co-production at the triadic and network level because triadic and network constellations go beyond the sum of the dyadic relationships between the involved actors due to indirect linkages.

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