European Journal of Operational Research 247 (2015) 685–698

Contents lists available at ScienceDirect

European Journal of Operational Research

journal homepage: www.elsevier.com/locate/ejor

Invited Review

Service supply chain management: A review of operational models ☆

Yulan Wang [a], Stein W. Wallace [b], Bin Shen [c], Tsan-Ming Choi [d,*]

[a] Faculty of Business, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong
[b] Department of Business, and Management Science, Norwegian School of Economics, NO-5045 Bergen, Norway
[c] Glorious Sun School of Business and Management, Donghua University, 200051 Shanghai, China
[d] Business Division, Institute of Textiles and Clothing, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong

ARTICLE INFO

Article history:
Received 10 November 2014
Accepted 19 May 2015
Available online 30 May 2015

Keywords:
Service supply chain management
Operational models
Coordination

ABSTRACT

Given the growing importance of service supply chain management (SSCM) in operations, we review a selection of papers in the operations research and the management science (OR/MS) literature that focus on innovative measures associated with the SSCM. First, we review and discuss the definitions of service supply chains (SSCs) and categorize SSCs into the Service Only Supply Chains (SOSCs) and the Product Service Supply Chains (PSSCs). Second, by classifying the literature into three major areas, namely service supply management, service demand management, and the coordination of service supply chains, we derive insights into the current state of knowledge in each area, and examine the evolution of the SSCM research over the past decade. Finally, we identify some associated research challenges and explore future directions for research on SSCM from an operational perspective.

1. Introduction

Services have received much attention in the operations research (OR) literature in recent years as the world economy has grown increasingly service oriented. For example, in developed markets such as the US, it is reported that over 90 percent of the GDP comes from the service industry. Even in developing countries, such as Brazil, Russia, India, China, and South Africa (BRICS), the service industry is developing rapidly. As a result, numerous projections predict that the world economy will eventually be ruled by services (Arnold, Javorcik, and Mattoo 2011).

Services play a crucial role in supply chain systems. There are a number of studies that review and discuss different definitions of service supply chain systems and service supply chain management (e.g., see Sakhuja, Jain, & Kumar, 2012).[1] In a supply chain system, by definition, there must be a "product" that is created by "the points of origin" and delivered at "the points of consumption". This "product" can be a tangible physical product or a service product. In the domain of service supply chain management, two types of supply chain systems arise, namely the Service Only Supply Chains (SOSCs) and the Product Service Supply Chains (PSSCs). In the following, we formally classify service supply chain systems into SOSCs and PSSCs to help us define the scope of our review and enhance the exposition of the discussions in the subsequent chapters. The corresponding meaning of "service supply chain management" is also illustrated in Fig. 1.

1.1. Service only supply chains

We define SOSCs as supply chain systems in which the "products" are pure services, and physical products do not play a role. For example, in many well-established service industries such as psychology advice, healthcare body checking, financial consultancy, and even fortune telling, the respective supply chains are SOSCs. We regard SOSCs as the most homogeneous kind of service supply chains, in which service management rules. Within the domain of SOSCs, there are numerous related definitions of service supply chain management.

☆ The authors sincerely thank the editor, and the anonymous reviewers for their kind comments which led to a major improvement of this paper. This paper is prepared upon the kind invitation by EJOR chief editor Professor Roman Slowinski. All authors have good contribution to this paper and the authorship listing follows a reversed alphabetical order. Yulan Wang gratefully acknowledges the financial support provided by The Hong Kong Polytechnic University (Project no.: A-PM23). Stein W. Wallace acknowledges support from the GREENSHIPRISK project, partly funded by the Research Council of Norway. Bin Shen's research is partially supported by National Natural Science Foundation of China (71401029) and the Shanghai Pujiang Program (14PJ1400200). Tsan-Ming Choi's research is partially supported by The Hong Kong Polytechnic University (Project No.: G-UA1Q).

* Corresponding author. Tel.: +852 27666450.
E-mail address: jason.choi@polyu.edu.hk, tsanmingchoi@yahoo.com.hk (T.-M. Choi).

[1] In this paper, we do not exhaustively review and examine all of the related definitions of the service supply chain. Interested readers are advised to refer to the aforementioned studies for further information.

http://dx.doi.org/10.1016/j.ejor.2015.05.053
0377-2217/

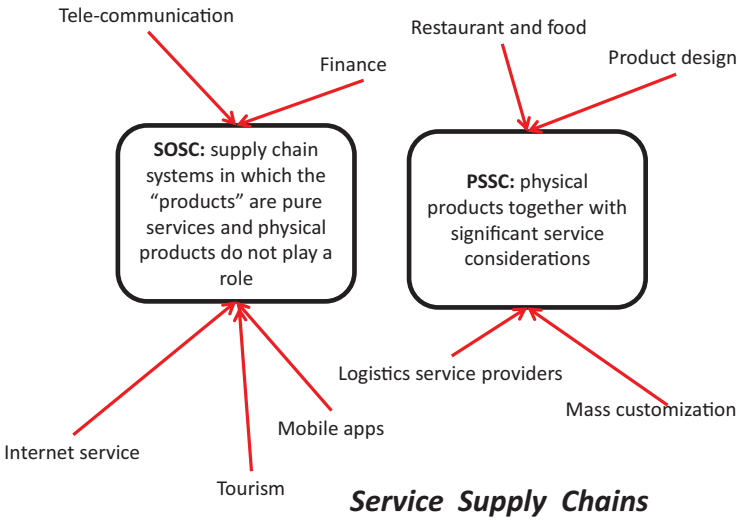

Fig. 1. Definition of service supply chains with examples.

Baltacioglu, Ada, Kaplan, Yurt, and Kaplan (2007) define a service supply chain system as "a network of suppliers, service providers, consumers, and other supporting units that performs the functions of transactions of resources required to produce services; transformation of these resources into supporting and core services; and the delivery of these services to customers." Sampson (2000) describes a service supply chain as a bidirectional system consisting of a customer, a service provider, and an initial service producer. Similar to Sampson (2000), Demirkan and Cheng (2008) define an application service supply chain as a system composed of three parties, the service producer for infrastructure, the retail service provider, and the customer. In the real world, SOSCs can be found in industries such as finance, tele-communication, internet service, mobile apps, and tourism.

1.2. Product service supply chains

Unlike SOSCs, many supply chains manage physical products together with significant service considerations. Thus, there are both "services" and "physical products" in these supply chain systems. We call such systems PSSCs. Ellram, Tate, and Billington (2004) define service supply chain management, in the context of our PSSCs, as follows: "Service supply chain management is the management of information, processes, capacity, service performance, 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." Arguably, there are more PSSCs than SOSCs explored in the literature. For example, we can find PSSCs in restaurant and food retail supply chains, product design and retailing supply chains, mass customization operations programs of different industries, and logistics service providers.

Motivated by the importance of service supply chain management, in this paper, we review operational models concerning service supply chain management, focusing on business-related problems and excluding technical services with purely engineering perspectives (such as programming issues for developing a "cloud service"). Note that there are a few studies that review service operations/supply chain management. For instance, Chase and Apte (2007) provide a comprehensive review of service operations management. Spring and Araujo (2009) discuss the application of product services in supply chains, while Stavrulaki and Davis (2014) conduct an excellent overview of service supply chain management with respect to the service delivery process. However, in this paper we focus on examining the adoption of operations research models in service supply chain systems from the three core perspectives, service supply management, service demand management, and service supply chain coordination. Operations research is about the application of advanced analytical methods to help make better decisions,[2] and the operations research models adopted in those reviewed papers range from various programming models and stochastic optimization to game theoretical models. In the selection of the technical papers to be covered in this review, we focus on examining the mainstream OR journals, such as *Annals of Operations Research, European Journal of Operational Research, IIE Transactions, International Journal of Production Economics, International Journal of Production Research, Journal of the Operational Research Society, Management Science, Manufacturing and Services Operations Management, Operations Research, OR Letters,* and *Production and Operations Management*, and the references therein. We intentionally exclude some well-established areas such as stochastic networks, and scheduling services as they have already been reviewed by others.

2. Service supply management

In SOSCs, in which services are the sole product, supply management is critical because the supplier usually plays the dominant role (Baltacioglu et al., 2007). In many service supply chains, the retailers/distributors simply act as brokers, while the supplier provides the real services directly to the final users/customers. For example, among Internet website hosting services, the technical support and real server hosting are provided by the supplier, and the retailers are the service agents who help achieve demand. There have only been limited studies on the supply management in this domain, partially because the respective service supply chains are relatively short and aspects such as supplier relationship management are ruled by the bargaining power between the service supplier and the service reseller (if any). Although service supply chains are usually short "vertically", it is worth noting that they can involve many parties "horizontally", which leads to some interesting analyses. For example, in the mobile phone service industry the respective supply chains involve many parties. Specifically, in this industry, nowadays consumers pay mobile phone companies (retailers) for services beyond just voice transmission, such as online data transfers and access services. These "additional" services are provided by third-party vendors, who pay to gain access to the mobile phone companies' consumer databases. It is

[2] This interpretation is found from Wikipedia, which shows the common understanding of operations research, across different disciplines.