



Similarities and contrasts of complexity, uncertainty, risks, and resilience in supply chains and temporary multi-organization projects

Antônio Márcio Tavares Thomé ^{a,1}, Luiz Felipe Scavarda ^{a,*},
Annibal Scavarda ^{b,2}, Felipe Eduardo Sydio de Souza Thomé ^{c,3}

^a Industrial Engineering Department, Pontifícia Universidade Católica do Rio de Janeiro Rua Marquês de São Vicente, 225 sala: 950 L, 22453-900 Rio de Janeiro, RJ, Brazil

^b Production Engineering School, Federal University of the State of Rio de Janeiro, Avenida Pasteur, 458 Urca, 22290-240 Rio de Janeiro, RJ, Brazil

^c Project Management Department, Saphyr, Brazil, Rua da Quitanda 86, 20091-005 Rio de Janeiro RJ, Brazil

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Abstract

Although complexity, uncertainty, risk, and resilience are concepts of growing interest, there is a lack of structured synthesis of these concepts and their relationships in supply chain management (SCM) and project management (PM) literatures. This paper addresses this gap through novel tertiary and bibliometric analyses. The tertiary research embraces 22 literature reviews and guides the development of the synthesis framework. The bibliometric analysis includes 1,275 papers and complements the tertiary research with study descriptors, a co-citation, and a static and dynamic/longitudinal co-word network analysis. Authors cite each other within the confines of their research area with no cross-fertilization of studies in PM and SCM, despite several commonalities among the areas. Both areas use similar conceptual definitions and there are close resemblances in risk management in SCM and temporary multi-organization (TMOs) projects. Resilience appears as a new topic in SCM but is absent in TMO. A research agenda closes the paper.

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1. Introduction

Nowadays, companies tend to compete as supply chains (SCs) and not individually within the boundaries of a single firm. SCs are “networks used to deliver products and services from suppliers of raw materials to end customers through an integrated

flow of information, material, and cash” (Blackstone, 2013 p. 171). Supply chain management (SCM) is the integration of key business processes along the SC that add value for customers and other stakeholders (Lambert et al., 1998). SCM embraces large, complex, and multi-faceted temporary projects for collaboration among independently owned firms. Modalities of supply chain collaboration (SCC) projects abound, such as vendor-managed inventories (VMI), continuous replenishment (CR), and collaborative planning, forecast, and replenishment (CPFR) (Hollman et al., 2015; Thomé et al., 2014).

SCC projects are equivalent in project management (PM) literature to temporary multi-organizations (TMOs) or “project organizations that consist of a multidisciplinary composition of participants employed by independent firms”, which are often

* Corresponding author. Tel.: +55 21 55 21 3527 1289; fax: +55 2155 21 3527 1288.

E-mail addresses: mt@puc-rio.br (A.M.T. Thomé), lf.scavarda@puc-rio.br (L.F. Scavarda), annibal.scavarda@unirio.br (A. Scavarda), felipesthome@gmail.com (F.E.S. de Souza Thomé).

¹ Tel.: +55 21 55 21 3527 1285/1286; fax: +55 2155 21 3527 1288.

² Tel.: +55 21 2530 8051/2542 1150.

³ Tel.: +55 21 3233-8150.

common in large construction (e.g., Lu and Yan, 2007) and software development projects (Lehtiranta, 2014 p. 640). As an indication of SCC relevance as structured projects, Yao et al. (2013) count more than 300 large-scale CPFR projects in the literature since the inception of the concept in 1998. In SCC projects, collaborative performance systems are established, decisions are synchronized, information is shared, and incentives are aligned among independently owned firms. All these initiatives aim to mitigate risks and to strengthen SC resilience to compete in ever-growing, complex, and uncertain markets.

Complexity, uncertainty, risk, and resilience are concepts of growing interest for academics and practitioners and have been the scope of several recent literature reviews in SCM (e.g., Colicchia and Strozzi, 2012; Fahimnia et al., 2015; Mandal, 2014; Serdarasan, 2013) and PM (e.g., Lehtiranta, 2014). Although there has been a great effort in the literature to address these issues, there is a lack of a structured synthesis of these concepts and their relationships bridging the fields of SCM and PM from an integrated and holistic perspective. This is important because PM literature traditionally treats complexity, uncertainty, and risks from a rather complementary but distinct perspective (e.g., Atkinson et al., 2006; Lehtiranta, 2014; Sanderson, 2012).

PM is a recent academic field, which started in engineering and computing as a technical area, and evolved to embrace management research and business schools (Bredillet, 2010). The SCM concept appeared in the early 1980s in operations management (OM). Since the beginning, SCM searches for mutual benefits of information sharing and coordination of decisions among independently owned companies in the SC (Alfalla-Luque and Medina-Lopez, 2009). As relatively new academic sub-fields, both PM and SCM are still unconsolidated (Bredillet, 2008; Bredillet, 2010; Hohenstein et al., 2015). In PM literature, the germane concepts of risk, complexity, and uncertainty are often associated with crisis management. Risk evolved from the deterministic perspective of “avoidable risks” linked to costs and schedules in individual projects to the complexity and uncertainty of relational risks in TMOs, rooted on collaborative work (e.g., Lehtiranta, 2011). Structural or known uncertainties are avoidable mainly through a reduction of complexity in construction projects (e.g., Giezen, 2012), while unknowable uncertainty brings unpredictability and the need for crisis management (Lehtiranta, 2011). In SCM, since the first definitions, risk has been associated with complexity, uncertainty, and resilience in a manner that resembles the concept of relational risks in TMOs. However, the notion of SC risks is network-related (Jüttner et al., 2003), rather than product-related, as in early PM risk management literature (Bredillet, 2010). Those similarities and contrasts are relevant for researchers and practitioners. As the two fields converge to a commonality of definitions and practices, consistent research streams are more likely to occur, and common best practices of collaborative work among independent firms might emerge. Within this context, this study is an attempt to contribute to close this gap, shredding light on similarities and contrasts between SCM- and PM-related concepts, and offering a research synthesis of complexity, uncertainty, risks, and resilience in SCM and PM. More specifically, this paper addresses two research questions.

R1: What are the analytical categories and relationships among complexity, uncertainty, risk, and resilience in SCM and PM?

R2: What are the directions for future research in SCM and PM related to the complexity, uncertainty, risk, and resilience framework?

Therefore, this paper offers as its main goals a tertiary research and a bibliometric analysis with a co-citation and static and dynamic/longitudinal co-word network analyses from primary studies on the relationships among complexity, uncertainty, risks, and resilience in both SCM and PM. Tertiary researches are reviews of secondary research through systematic literature review (SLR) of primary studies (Glock et al., 2014; Verner et al., 2014). SLR aims to respond to specific research questions in an objective, transparent, and reproducible manner (Denyer and Tranfield, 2009; Tranfield et al., 2003) as opposed to selectively reporting on topics of interest, introducing primary research, or providing scholarly narratives of selected research topics in traditional reviews (Petticrew and Roberts, 2006). Bibliometric analysis and study of co-citation networks are powerful techniques to categorize topical areas, to cluster related research and researchers, and to identify more recent and emerging themes (Fahimnia et al., 2015).

This paper is organized as follows. Section 2 describes the methods and results from the tertiary research and the synthesis framework outlining the relationships among the constructs of complexity, uncertainty, risks and resilience. Section 3 provides the methods of the bibliometric analysis and presents the results by study descriptors, static co-occurrences of keywords and co-citation network, and a post hoc longitudinal analysis of keywords. Section 4 discusses the conceptual similarities and contrasts between the PM and SCM research domains. Conclusions and a research agenda are offered in the paper’s last section.

2. Tertiary research

2.1. Methods of tertiary research

The seven-step approach for SLR proposed by Cooper (2010) is adapted for the overview of the literature reviews. In the first step, the objective of the study is delimited and the research questions are specified.

The search and selection of studies comprise the second step and follow the suggestions by Thomé et al. (2012, 2014). The 2010 Combined Journal Guide of the British Association of Business Schools (ABS) was used for the literature search in SCM (Petersen et al., 2011). All journals belonging to grades four and three of the British ABS in the areas of “operations, technology, and management” were selected for the SCM search. The PM field was systematically searched with the addition of four major journals. Consistent with Lehtiranta (2014), the *International Journal of Project Management*, *Project Management Journal*, *Journal of Construction Engineering and Management*, and the *IEEE Transactions on Software Engineering* were chosen because they appeal to a large audience of scholars and are representative of TMOs

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