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A fuzzy AHP-TOPSIS framework for ranking the solutions of Knowledge Management adoption in Supply Chain to overcome its barriers

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ABSTRACT

The aim of this study is to identify and prioritize the solutions of Knowledge Management (KM) adoption in Supply Chain (SC) to overcome its barriers. It helps organizations to concentrate on high rank solutions and develop strategies to implement them on priority. This paper proposes a framework based on fuzzy analytical hierarchy process (AHP) and fuzzy technique for order performance by similarity to ideal solution (TOPSIS) to identify and rank the solutions of KM adoption in SC and overcome its barriers. The AHP is used to determine weights of the barriers as criteria, and fuzzy TOPSIS method is used to obtain final ranking of the solutions of KM adoption in SC. The empirical case study analysis of an Indian hydraulic valve manufacturing organization is conducted to illustrate the use of the proposed framework for ranking the solutions of KM adoption in SC to overcome its barriers. This proposed framework provides a more accurate, effective and systematic decision support tool for stepwise implementation of the solutions of KM adoption in SC to increase its success rate.

1. Introduction

With the rapid changes and pressure of global competition, knowledge has become as the key factor of business success to achieve the competitive advantage (Cheng, Yeh, & Tu, 2008; Tesang, 2009). Knowledge adds value to an organization through its contribution to products, processes and people, while Knowledge Management (KM) transforms information, data and intellectual assets into enduring value by identifying useful knowledge for management actions (Goh, 2006). KM consists of processes that facilitate the application and development of organizational knowledge, in order to create value and to increase and sustain competitive advantage (Zhao, Pablo, & Qi, 2012). KM is recognized as an important source of competitive advantage and hence there has been increasing academic and practitioner interest in understanding and isolating the factors that contribute to effective knowledge transfer between Supply Chain (SC) actors (He, Ghobadin, & Gallear, 2013). The KM adoption in SC enables a collaborative environment that enables the chain to be more adaptive and responsive to achieve an improved strategic competitive position in the market place. KM among SC members can provide a guarantee for the chain members to access the external knowledge, but also it is helpful to improve overall competitiveness of the entire SC (Li & Hu, 2012; Zhengyi & Ronghua, 2005). More generally, managing knowledge within SC can help organizations to promote better use of resources. KM and SC represent two main streams of research that have significantly developed over the past several years and many related issues are still not addressed by consultants, practitioners or academics.

1.1. Research motive

KM treats knowledge as an asset and manages it in a systematic way to achieve the goal of enhancement of SC performance and competitiveness. Still why only a few SC members can benefit from the KM? One of its reasons is knowledge transfer and knowledge sharing between groups with dissimilar purposes and dissimilar practices is difficult to achieve either within an organization or between trading partners belonging to the same SC (Marra, Ho, & Edwards, 2011). Another reason is incomplete understanding of what causes KM adoption in SC to fail. In view of this it is essential to identify barriers of KM adoption in SC.

The barriers of KM adoption in SC can identified through literature review and expert opinion. However, in a strategic view, these barriers are significant but not possible to overcome all at the same time. Even a same barrier may be differently important to the individual organization with the varied priorities; due to each organization has its own purposes, strategies, conditions of resources, and capabilities. Hence it is noticed that in order to enhance KM adoption in SC successful, concrete and feasible solutions must be proposed and ranked to overcome these barriers in stepwise manner.

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1.2. Research goal

The aim of this paper is to explore the barriers of KM adoption in SC and propose and prioritize the solutions to overcome these barriers. It is important to prioritize these solutions so that organizations may develop strategies to implement these solutions on priority basis to overcome the barriers of KM adoption in SC and achieve competitive advantage.

To prioritize the solutions of KM adoption is multi criteria decision making (MCDM) problem. Human judgment in decision making has been often unclear and hard to estimate by exact numerical values. Hence fuzzy logic is necessary for handling problems characterized by vagueness and imprecision. This paper proposes hybrid fuzzy Analytical hierarchy process (AHP) and fuzzy technique for order performance by similarity to ideal solution (TOPSIS) framework to prioritize the solutions of KM adoption in SC. This study utilizes fuzzy AHP (Saaty, 1980) to determine importance weights of the barriers and fuzzy TOPSIS (Hwang & Yoon, 1981) to obtain performance ratings of feasible solutions with triangular fuzzy numbers (TFN). Lastly, a empirical case study is presented to demonstrate the application of proposed framework.

The rest of this paper is organized as follows. Section 2 briefly reviews the literature on barriers and solutions of KM adoption in SC. The Fuzzy AHP and fuzzy TOPSIS methods are presented in Section 3. The proposed framework for prioritize the solutions of KM adoption in SC is described in Section 4. The empirical case study is conducted and described in Section 5. Finally, the conclusion is discussed in Section 6.

2. Literature review

2.1. Barriers of KM adoption in SC

KM and SC have taken more than a decade to facilitate mature disciplines where they can be exploited for enhancing business profitability and value. In order to adopt KM effectively, some creditable works have provided several barriers of KM adoption in SC (See Table 1).

The SC has some difficulties and challenges to promote KM such as KM is not integrated into business processes; the performance of KM is difficult to assess; the participation level of KM is low; and the funds of KM are insufficient (Zhao et al., 2012). If top management is not committed to KM adoption in SC, it seems to have led to a situation where a common understanding concerning organizational vision, strategies and supplier/customer relationship management was not present (Natti & Ojaslo, 2008).

The development of knowledge-based SC depends on the nature of knowledge flow in the entire chain. SC partners will find it very useful to share decision knowledge on a timely basis. However managerial mindsets and corporate culture are the main hurdle for it (Shih, Hsu, Zhu, & Balasubramanian, 2012). The deep organization structure hierarchy seems to hinder the upward flow of communication and stops the vertical sharing of knowledge (Aziz & Sparrow, 2011; Kasper, Muhlbacher, & Muller, 2008). The attitude towards the learning and sharing of new knowledge is one of the important barriers preventing the building of a knowledge-creation in the organization (Vithessonthi, 2008). The

Table 1
Initial hierarchy model of barriers of KM adoption in SC and its criteria.

Main criterion	C. code	Sub criteria	References
Strategic barriers	SB 1	Lack of strategic planning regarding KM adoption in SC	Blumenberg, Wagner, and Beimborn (2009), Raisinghani and Meade (2005)
	SB 2	Lack of roles and responsibilities of SC members	Natti and Ojasalo (2008)
	SB 3	Lack of fund for KM system development	Zhao et al. (2012), Ahmad and Daghfous (2010)
	SB 4	Lack of top management commitment towards KM adoption in SC	Bandyopadhyay and Pathak (2007)
	SB 5	Lack of clear understanding of KM adoption n SC	Shih et al. (2012), Aziz and Sparrow (2011)
	SB 6	KM not integrated with SC business process	Zhao et al. (2012), Natti and Ojasalo (2008)
Organizational barriers	OB 1	Lack of proper organizational structure to create and share knowledge	Natti and Ojasalo (2008), Ahmad and Daghfous (2010)
	OB 2	Communication and knowledge flows are restricted into certain directions of SC	Shih et al. (2012), Al-Mutawah et al. (2009), Kasper et al. (2008)
	OB 3	Knowledge retention of highly skilled and experienced staff is not a high priority	Fletcher and Polychronakis (2007)
	OB 4	Deficiency in organizations resources that would provide adequate knowledge sharing opportunities to employees.	Aziz and Sparrow (2011)
	OB 5	No adequate knowledge of functioning of other SC members	Natti and Ojasalo (2008), Aziz, and Sparrow (2011)
	OB 6	Opportunistic behavior of SC members	Cheng et al. (2008)
	OB 7	Shortage of formal and informal spaces to share, reflect and generate knowledge	Hutzschenreuter and Horstkotte (2010)
Technological Barriers	TB 1	Lack of technological infrastructure to adopt KM in SC	Wong and Wong (2011)
	TB 2	Difficulty in codifying tacit knowledge	Wagner and Buko (2005), Simonin (2004)
	TB 3	Low data and information security within SC	Kumar and Thondikulam (2006), Gunasekaran and Ngai (2004)
	TB 4	Lack of Service exchange	Cheung et al. (2012), Paton and McLaughlin (2008)
	TB 5	Lack of technical assistance to suppliers	Hutzschenreuter and Horstkotte (2010)
Cultural barriers	CB 1	Lack of willingness and sharing spirit among SC members	Natti and Ojasalo (2008), Shih et al. (2012), Hutzschenreuter and Horstkotte (2010)
	CB 2	Lack of trust and commitment of SC members	Shih et al. (2012), Samuel et al. (2011), Vithessonthi (2008), Maqsood and Finegan (2007), Spekman et al. (2002)
	CB 3	Lack of empowerment among SC members	Samuel et al. (2011)
	CB 4	Lack of motivation and reward	Hutzschenreuter and Horstkotte (2010)
	CB 5	Different values, cultural and linguistic environment within SC members	Natti and Ojasalo (2008), Wong and Wong (2011), Myers and Cheung (2008)
Individual barriers	IB 1	Fear of embarrassment for sharing incorrect information	Pillai and Min (2010), Willem and Buelens (2007)
	IB 2	Lack of time to share knowledge	Aziz and Sparrow (2011)
	IB 3	Fear of loss of intellectual property ownership	Chou and Passerini (2009)
	IB 4	Poor verbal/written communication, interpersonal and computer skills	Hutzschenreuter and Horstkotte (2010), Joshi, Sarker, and Sarker (2006)
	IB 5	Lack of education and training to SC members	Blumenberg et al. (2009)