Int. J. Production Economics 145 (2013) 233–252

Contents lists available at SciVerse ScienceDirect

Int. J. Production Economics

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

Leveraging power of learning capability upon manufacturing operations

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ARTICLE INFO

Article history:
Received 20 April 2012
Accepted 15 March 2013
Available online 7 May 2013

Keywords:
Dynamic capabilities
Operational capabilities
Routines
New product development
Supplier integration

ABSTRACT

Learning capability (LC) is a special dynamic capability that a firm purposefully builds to develop a cognitive focus, so as to enable the configuration and improvement of other capabilities (both dynamic and operational) to create and respond to market changes. Empirical evidence regarding the essential role of LC in leveraging operational manufacturing capabilities is, however, limited in the literature. This study takes a routine-based approach to understand capability, and focuses on demonstrating leveraging power of LC upon two essential operational capabilities within the manufacturing context, i.e., operational new product development capability (ONPDC), and operational supplier integration capability (OSIC). A mixed-methods research framework was used, which combines sources of evidence derived from a survey study and a multiple case study. This study identified high-level routines of LC that can be designed and controlled by managers and practitioners, to reconfigure underlying routines of ONPDC and OSIC to achieve superior performance in a turbulent environment. Hence, the study advances the notion of knowledge-based dynamic capabilities, such as LC, as routine bundles. It also provides an impetus for managing manufacturing operations from a capability-based perspective in the fast changing knowledge era.

1. Introduction

In strategic management literature, organizational routines have been perceived as the foundation of capabilities (Eisenhart and Martin, 2000; Nelson and Winter, 1982; Teece, 2007). These routines are broadly defined as regular and predictable patterns of behaviors, or the way work is done (Teece et al., 1997), and have a wide range of variations. Some are constantly changing, while others are relatively static, which indicates the underlying phenomena and dynamics (Pentland and Feldman, 2005). Static operational capabilities are created by a collection of operating routines that execute procedures for the purpose of generating current revenue and profit (Nelson and Winter, 1982; Zollo and Winter, 2002). Dynamic capabilities are created by a collection of search routines that bring about desirable changes in the existing set of operating routines or the development of new ones, in order to sustain competitive advantage in a rapidly changing environment (Helfat et al., 2007; Kyläheiko et al., 2002). In other words, operational or 'zero-level' capabilities are those that permit a firm to generate revenue and profit, in the short term, while dynamic capabilities are 'higher-level' capabilities that operate to extend, modify or create operational capabilities for the purpose of enhancing profit in the future (Winter, 2003; Zollo and Winter, 2002).

It has been asserted that deliberate organizational learning is responsible for modifying and renewing both dynamic and operational capabilities, over time (Kyläheiko et al., 2002; Zollo and Winter, 2002). Accordingly, knowledge-based learning capability (LC) is perceived as a highly intelligent dynamic capability that enables both knowledge exploration and exploitation (Azadegan and Wagner, 2011; March, 1991). The process facilitates the modification and configuration of capabilities, in particular, the operational capabilities (Nooteboom, 2009). The strategic importance of LC hence lies in its ability to create cognitive mechanisms that can innovatively respond to market changes.

The advent of rapidly advancing information technologies and fierce global competition has changed the traditional business models of manufacturing firms. Innovative new product development (NPD) and supplier integration have become underlying routines of essential operational manufacturing capabilities to effect performance outcomes (Marsh and Stock, 2006; Terpend et al., 2008). The degree to which operational capabilities produce superior performance appears to be affected by a certain collection of underlying routines of LC (e.g., Allred et al., 2011; da Silva Gonçalves Zangiski et al., 2013; Hull and Covin, 2010;

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http://dx.doi.org/10.1016/j.ijpe.2013.04.042

Li et al., in press; Pavlou and El Sawy, 2011; Peng et al., 2008). The leveraging power of learning contingencies upon the core manufacturing operational routines has been proposed (Azadegan et al., 2008). However, little research has been undertaken into how organizational learning engenders and modifies operational capabilities as bundles of interrelated yet distinct routines.

In view of this research need, the current study aims to investigate the leveraging power of LC in enabling operational NPD capability (ONPDC), as well as operational supplier integration capability (OSIC) to effect performance outcomes within a turbulent manufacturing industry. The study sought to answer two research questions: (1) does LC moderate the relationships between operational manufacturing capabilities (i.e., ONPDC and OSIC) and performance outcomes? (2) How do certain underlying routines of LC reconfigure and modify specific underlying routines of ONPDC and OSIC within various manufacturing contexts?

Rather than focusing on producing an exhaustive set of measures for the capabilities under investigation, the primary objective of the study was to demonstrate how certain underlying routines of LC could be manipulated by managers and practitioners to redesign and enable specific operational routines of NPD and supplier integration, and so better match the market environment. To fulfill the research objective, a mixed methods research framework (Morse, 2003; Yin, 2009) was adopted. It combined the evidence derived from multiple sources, using quantitative and qualitative data collection and analytical techniques, in sequential phases. Building upon the capability assertions as well as empirical evidence, established within the manufacturing context, the survey study was undertaken to empirically identify significant moderating effects of particular underlying routines of LC on those of ONPDC and OSIC, thereby providing answers for the first research question. An explanatory multiple-case study was subsequently undertaken to provide answers for the second research question.

The impetus for adopting the case study approach stemmed from the need to reveal the underlying insights of the relationships identified within real-life manufacturing contexts, as well as to uncover contextual conditions, which potentially influence the strength of modifying effects of LC. From a theoretical perspective, the study advanced the notion of knowledge-based dynamic capabilities, for example LC, as routine bundles, which enable manufacturing routines to robustly handle a turbulent business environment. The study not only identified specific high-level learning routines that could be manipulated by managers and practitioners to leverage their core operational manufacturing routines, but also highlighted the contextual conditions that potentially influence the degree of the leveraging effect. The findings have significant implications for manufacturing operations.

The remainder of the paper is structured as follows. Based on the literature review, the next section addresses the strategic importance of LC and posits its leveraging power, which matches ONPDC and OSIC with the market needs in a constantly changing environment. The mixed methods research framework is then presented, followed by the data analysis of both the survey study and the multiple-case study. The paper concludes with a discussion on the theoretical contributions, managerial implications and future research directions of LC in manufacturing operations.

2. Theory and hypotheses

2.1. Leveraging power of learning capability

The evolution of the research studies in the areas of knowledge management (e.g. Nonaka, 1994), absorptive capacity (e.g. Cohen and Levinthal, 1990) and dynamic capabilities (e.g. Zollo and Winter, 2002) have gradually led to an integrative conceptualization of a knowledge-based dynamic capability, which incorporates both internal and external learning routines (Lewin et al., 2011; Lichtenthaler and Lichtenthaler, 2009). The capability is purposely developed by a firm to reconfigure and realign learning routines which explore, retain and exploit both internal (intra-firm) and external (inter-firm) knowledge for achieving superior performance (Lewin et al., 2011; Lichtenthaler and Lichtenthaler, 2009).

The influential concept of absorptive capacity was initially proposed by Cohen and Levinthal (1990) as a firm's ability to recognize, assimilate and apply new knowledge from an external environment for sustaining competitive advantage through innovation. The later concept rectification conceptualizes absorptive capacity as a dynamic capability that is imbedded in higher-order learning routines, thereby recognizing its capacity to influence the reconfiguration of other capabilities and routines in the firm (Lane et al., 2006; Zahra and George, 2002). Recently Lewin et al. (2011) perceive absorptive capacity as a knowledge-based dynamic capability that integrates both internal and external learning routines. Internal learning facilitates new idea generation, enables internal knowledge dissemination and combination, and updates old routines through knowledge application (Nelson and Winter, 1982; Nonaka, 1994; Zollo and Winter, 2002). External learning identifies, acquires, assimilates, transforms, and exploits knowledge from external sources for the purpose of creating new commercial output (Lewin et al., 2011). Lewin et al. (2011) argue that external learning routines are only useful if the acquired knowledge can be transferred back into the firm, and further integrated with internal learning routines for knowledge generation.

The conceptualization of the knowledge-based dynamic capability also reflects exploratory and exploitative learning (Lewin et al., 2011; Lichtenthaler and Lichtenthaler, 2009). Knowledge exploration is carried out by both external learning routines, that recognize and assimilate valuable external new knowledge, and internal learning routines, that create and select new knowledge within firm boundaries (Lewin et al., 2011; March, 1991). Exploratory learning allows firms to experiment with new alternatives, and generate technological change that is necessary for managing challenge in a turbulent environment (Lane et al., 2006; Zollo and Winter, 2002). In contrast, knowledge exploitation is carried out by routines that apply both externally acquired and internally generated knowledge to reconfigure operating routines (Lane et al., 2006; Zollo and Winter, 2002). In line with March (1991), the conceptualization also highlights the necessity of reaching a balance between exploratory and exploitative learning (Lewin et al., 2011; Lichtenthaler and Lichtenthaler, 2009). The cognitive view of firm (Nooteboom, 2009) explains how such a balance can be achieved across different contexts.

According to Nooteboom (2009), 'cognitive distance' exists between individuals to the extent that they have developed different interpretation and understanding of the world along different life paths and in different environments. The primary purpose of a firm is to serve as a cognitive "focusing device" (Nooteboom, 2007, p. 31) that configures the cognitive distance between its members. An optimal cognitive distance is large enough to enable exploratory learning that generates innovative ideas through novel combination of complementary resources, whilst not so distant to preclude necessary mutual understanding needed for exploitative learning to increase efficiency in adaptive process (Nooteboom, 2007). Following this rationale, the essence of the knowledge-based dynamic capability lies in its capacity