

The relationship between environmental hostility and manufacturing flexibility: the role of operational absorptive capacity

EuiBeom, Jeong (Korea University Business School)

Keontaek, Oh (Korea University Business School)

DaeSoo, Kim (Korea University Business School, kimd@korea.ac.kr)

Abstract

We propose a conceptual model for probing into the nomological network of influence among environmental hostility, individual and organizational operational absorptive capacity, and internally- and externally-driven manufacturing flexibility. Environmental hostility reflects hypercompetition in business environment. Operational absorptive capacity is measured in individual and organizational dimensions. Manufacturing flexibility is measured as internally- and externally-driven flexibility. The primary purpose of this research is to scrutinize the role of individual absorptive capacity on internally-driven manufacturing flexibility leading to externally-driven manufacturing flexibility in hypercompetitive market, both moderated by organizational absorptive capacity. The structural equation modeling analysis results provide interesting theoretical and practical insights.

Keywords: Empirical research in operations management, operations strategy

1. Introduction

The industrial environment has changed radically over the last two decades, with rapid technology advances, dynamic market conditions, shorter product life-cycles and faster customer needs changes often difficult to foresee. In this hypercompetitive environment, competitive success in manufacturing is strongly linked to the ability of a firm to respond quickly and flexibly to its environment and meet the emerging challenges with innovative responses (Cohen and Levinthal, 1990). Researchers and practitioners have long addressed the importance of firms' flexible adaptation and response to business environment to be more competitive and survive (Mendelson and Pillai, 1998).

In the growing complexity and uncertainty of today's business environment, firms continue to explore various ways of developing and enhancing manufacturing flexibility to better respond to environmental uncertainty and hostility. That is, manufacturing flexibility may be considered an indispensable component for firms to apply more productive manufacturing processes and to adapt and respond better to its market (Upton, 1994), thereby gaining sustainable competitive advantage (Volberda, Foss, and Lyles, 2010).

In fact, Zahra and George (2002) assert that absorptive capacity as dynamic capability can lead to enhancing capabilities required for confronting with environmental shifts. Yet to date, little has been known about how business environment and absorptive capacity interplay in improving operational performance. Specifically, it has not been investigated how environmental hostility influences manufacturing flexibility mediated by absorptive capacity. Moreover, previous studies on absorptive capacity have largely overlooked the role of individuals in developing, deploying, and maintaining a firm's absorptive capacity which in turn drives operational performance, despite its importance in effectively absorbing external knowledge (ter Wal et al., 2011). That is, prior researches have focused mainly on the firm level, not the individual level of absorptive capacity (Volberda, Foss, and Lyles, 2010). As such, it has remained unclear as to how individual and firm levels of absorptive capacity interplay and influence performance in hostile environment. In addition, there have been few studies examining absorptive capacity in the operations management literature (Patel et al., 2012; Tu et al., 2006), despite their growing importance (Tu et al., 2006). Consequently, we aim to advance the knowledge on learning capability affecting manufacturing flexibility in hypercompetitive market by studying the interplay between environmental hostility and operational absorptive capacity. We further study the role of individual absorptive capacity on internally-driven manufacturing flexibility leading to externally-driven manufacturing flexibility in hypercompetitive market, both moderated by organizational absorptive capacity. To do so, we employ the empirical survey methodology by using the data obtained from 428 manufacturing firms by the Korea Productivity Center.

2. Literature Review

2.1. Environment hostility

The business environment has long been identified as an important issue in conceptual and empirical studies (Thompson, 1967). In most studies, the business environment is multidimensional, with multiple and different effects on organizational characteristics (Keats and Hitt, 1988). Aldrich (1979) developed six environmental dimensions: capacity, homogeneity, stability, concentration, consensus, and turbulence. Dess and Beard (1984) later collapsed these dimensions into a parsimonious set of three: munificence, dynamism, and complexity. Miller (1994) focused on the dimensions of dynamism, hostility, and heterogeneity as key challenges facing firms. Specifically, environmental hostility indicates unfavorable external forces for a firm's business (Zahra and Garvis, 2000) and reflects hypercompetition in business environment.

2.2. Operational Absorptive Capacity

Researchers and practitioners have long addressed the importance of flexible adaptation and response to business environment to be more competitive and grow. Absorptive capacity is defined as the ability of a firm to obtain, assimilate, and utilize external knowledge for its goals (Cohen and Levinthal, 1990), which can lead to enhancing capabilities required for confronting with environmental shifts (Zahra and George, 2002; Cohen and Levinthal, 1990). Previous studies on absorptive capacity have focused on a wide spectrum of areas, including investment in research and development (Cohen and Levinthal, 1990, 1994), research productivity in pharmaceutical firms (Cockburn and Henderson, 1998), innovation in banking services (Buzzacchi et al., 1995), information technology use (Boynton et al., 1994), inward technology licensing (AtuaheneGima, 1992), strategic alliances (Koza and Lewin, 1998;

Kumar and Nti, 1998; Lane and Lubatkin, 1998; Mowery et al., 1996; Shenkar and Li, 1999), knowledge transfer (Szulanski, 1996), and organizational learning (Cohen and Levinthal, 1990; Lane and Lubatkin, 1998; Shenkar and Li, 1999). However, there have been few studies explaining absorptive capacity in the operations management literature despite its growing popularity in effectively absorbing and utilizing external knowledge (Cohen and Levinthal, 1990; ter Wal et al., 2011). Thus, we use operational capacity, indicating “the ability of firm’s operational units can acquire, assimilate, and transform external information” (Patel et al., 2012, p.203). As such, operational absorptive capacity is an important learning capability that may explain why some firms are able to develop more effective responses to environmental uncertainty than others. In other words, a firm with high operational absorptive capacity can effectively and efficiently obtain external knowledge and information about demand, and quickly increase the range and mobility of components of manufacturing flexibility such as machines, labor, and materials (Patel et al., 2012).

2.3. Manufacturing Flexibility

Since Hayes and Wheelwright (1984) first emphasized the importance of manufacturing flexibility, it is widely recognized as a critical component to building a competitive advantage in an increasingly turbulent market place. Manufacturing flexibility is regarded as a multi-dimensional concept within the manufacturing function. Sethi and Sethi (1990) suggest 11 dimensions of manufacturing flexibility, Gupta and Somers (1996) identify nine, whereas Gerwin’s (1993) taxonomy consists of seven dimensions which include volume flexibility, material handling flexibility, mix flexibility, modification flexibility, changeover flexibility, rerouting flexibility, and flexibility responsiveness. D’Souza and Williams (2000) focuses on four dimensions (volume flexibility, variety flexibility, process flexibility, and materials handling flexibility) within the manufacturing or production function of the organization and the plant. Furthermore, they also note two of these dimensions (process flexibility and material handling flexibility) are “internally-driven,” toward operational activities of the manufacturing function. The other two dimensions (volume flexibility and variety flexibility) are “externally-driven,” toward meeting the market needs of the firm.

3. Research design

We aim to advance the knowledge on learning capability affecting manufacturing flexibility in hypercompetitive market by studying the interplay between environmental hostility and operational absorptive capacity. To do so, using the survey data obtained from 428 manufacturing firms by the Korea Productivity Center, we empirically test the effect of environmental hostility on internally-driven flexibility mediated by individual and organizational operational absorptive capacity, and subsequently on externally-driven manufacturing flexibility. To test a set of hypothesized relations, we use structural equation modeling by using MPlus.

4. Findings

The result without mediating individual operational absorptive capacity indicates that environmental hostility is positively related to internally-driven manufacturing flexibility, which then positively influences externally-driven manufacturing flexibility. Interestingly, however, the result with mediating individual operational absorptive capacity shows that the influence of environmental hostility on manufacturing flexibility is fully mediated by

individual operational absorptive capacity. Moreover, the result reveals that organizational operational absorptive capacity moderates the relationship between individual operational absorptive capacity and both internally- and externally-driven manufacturing flexibility.

5. Contribution

This study contributes to the existing body of knowledge on the relationship between environment and manufacturing flexibility from learning and operations perspectives. We do so by examining the mediating role of individual operational absorptive capacity and moderating role of organizational operational absorptive capacity, along with the sequential dimensions of manufacturing flexibility. From an empirical test of large manufacturing firm data set, we discover that individual operational absorptive capacity can proactively react to environmental hostility by enhancing capabilities required for internally-driven manufacturing flexibility. Further, organizational operational absorptive capacity can synergize individual operational absorptive capacity such that those together can improve not only internally-driven and externally-driven manufacturing flexibility. In future research, this study can be further extended by including other dimensions of environment and flexibility and incorporating and firm size and industry effects

References

- Aldrich, H. (1979). "Organizations and environments", Englewood Cliffs, NJ: Prentice-Hall.
- Atuahene-Gima, K. (1992), "Inward technology licensing as an alternative to internal R&D in new product development: a conceptual framework", *Journal of Product Innovation Management*, Vol. 9, No. 2. pp. 156-167.
- Boynton, A.C., Zmud, R.W., Jacobs, G.C. (1994), "The influence of IT management practice on IT use in large organizations", *Mis Quarterly*, Vol. 18, No.3, pp. 299-318.
- Buzzacchi, L., Colombo, M.G., Mariotti, S. (1995), "Technological regimes and innovation in services: the case of the Italian banking industry", *Research Policy*, Vol. 24, No. 1, pp. 151-168.
- Cockburn, I.M., Henderson, R.M. (1998), "Absorptive capacity, coauthoring behavior, and the organization of research in drug discovery", *The Journal of Industrial Economics*, Vol. 46, pp.157-182.
- Cohen, W.M., Levinthal, D.A. (1994), "Fortune favors the prepared firm", *Management Science*, Vol. 40, No. 2, pp. 227-251.
- Dess, G.G., Beard, D.W. (1984), "Dimensions of organizational task environments", *Administrative science quarterly*, Vol. 29, No. 1, pp. 52-73.
- D'Souza, D.E., Williams, F.P. (2000), "Toward a taxonomy of manufacturing flexibility dimensions", *Journal of Operations Management*, Vol. 18, No. 5, pp. 577-593.
- Gerwin, D. (1987), "An agenda for research on the flexibility of manufacturing processes", *International Journal of Operations & Production Management*, Vol. 7, No. 12, pp. 38-49.
- Gupta, Y.P., Somers, T.M. (1996), "Business strategy, manufacturing flexibility, and organizational performance relationships: a path analysis approach", *Production and Operations Management*, Vol. 5, No. 3, pp. 204-233.
- Hayes, R.H., Wheelwright, S.C. (1984), "Restoring our competitive edge: competing through manufacturing", *American Journal of Small Business*.
- Keats, B.W., Hitt, M.A. (1988), "A causal model of linkages among environmental dimensions, macro organizational characteristics, and performance", *Academy of management journal*, Vol. 31, No. 3, pp. 570-598.
- Koza, M.P., Lewin, A.Y. (1998), "The co-evolution of strategic alliances", *Organization science*, Vol. 9, No. 3, pp. 255-264.
- Kumar, R., Nti, K.O. (1998), "Differential learning and interaction in alliance dynamics: a process and outcome discrepancy model", *Organization science*, Vol. 9, No. 3, pp. 356-367.
- Lane, P.J., Koka, B.R., Pathak, S. (2006), "The reification of absorptive capacity: a critical review and

- rejuvenation of the construct”, *Academy of management review*, Vol. 31, No. 4, pp. 833-863.
- Mendelson, H., Pillai, R.R. (1998), “Clockspeed and informational response: evidence from the information technology industry”, *Information Systems Research*, Vol. 9, No. 4, pp. 415-433.
- Miller, D., Friesen, P.H. (1983), “Strategy-making and environment: the third link”, *Strategic management journal*, Vol.4, No. 3, pp. 221-235.
- Mowery, D.C., Oxley, J.E., Silverman, B.S. (1996), “Strategic alliances and interfirm knowledge transfer”, *Strategic management journal*, Vol. 17, No. 52, pp. 77-91.
- Patel, P.C., Terjesen, S., Li, D. (2012), “Enhancing effects of manufacturing flexibility through operational absorptive capacity and operational ambidexterity”, *Journal of Operations Management*, Vol. 30, No. 3, pp. 201-220.
- Sethi, A.K., Sethi, S.P. (1990), “Flexibility in manufacturing: a survey”, *International journal of flexible manufacturing systems*, Vol. 2, No. 4, pp. 289-328.
- Shenkar, O., Li, J. (1999), “Knowledge search in international cooperative ventures”, *Organization Science*, Vol. 10, No. 2, pp. 134-143.
- Szulanski, G. (1996), “Exploring internal stickiness: Impediments to the transfer of best practice within the firm”, *Strategic management journal*, Vol. 17, No. 53, pp. 27-43.
- Thompson, J.D. (1967), “Organizations in action: Social science bases of administrative theory”, *Transaction publishers*.
- ter Wal, A., Criscuolo, P., Salter, A. (2011), “Absorptive capacity at the individual level: an ambidexterity approach to external engagement”, *DRUID 2011-INNOVATION, STRATEGY, and STRUCTURE-Organizations, Institutions, Systems and Regions*.
- Tu, Q., Vonderembse, M.A., Ragu-Nathan, T., Sharkey, T.W. (2006), “Absorptive capacity: enhancing the assimilation of time-based manufacturing practices”, *Journal of Operations Management*, Vol. 24, No. 5, pp. 692-710.
- Upton, D.M. (1994), “The management of manufacturing flexibility”, *California Management Review*, Vol. 36, No. 2, pp. 72-89.
- Volberda, H.W., Foss, N.J., Lyles, M.A. (2010), “Perspective-absorbing the concept of absorptive capacity: how to realize its potential in the organization field”, *Organization Science*, Vol. 21, No. 4, pp. 931-951.
- Zahra, S.A., Garvis, D.M. (2000), “International corporate entrepreneurship and firm performance: the moderating effect of international environmental hostility”, *Journal of Business Venturing*, Vol. 15, No. 5-6, pp. 469-492.
- Zahra, S.A., George, G. (2002), “Absorptive capacity: a review, reconceptualization, and extension”, *Academy of Management Review*, Vol. 27, No. 2, pp.185-203.