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DYNAMIC AND OPERATIONAL CAPABILITIES FOR INNOVATION: THEIR INFLUENCE ON EXPORT MARKET EFFECTIVENESS

Margarida Vicente*, Cláudia Seabra*, José Luís Abrantes* and Mário Sérgio Teixeira**

*Polytechnic Institute of Viseu, Portugal

**University of Trás-os-Montes e Alto Douro, Portugal

Abstract

This paper analyzes the influence of technological turbulence, organizational management dynamic capability and operational capabilities for innovation on export market effectiveness. Based on the dynamic capability view, we investigate the effect of technological turbulence on organizational management dynamic capability, and how this latter contributes to leverage operational capabilities for innovation in order to benefit performance in export markets. To test the hypotheses, we carry out a structural equation model, using a sample of 471 exporting manufacturers firms that operate from Portugal. The results demonstrate that technological turbulence is an antecedent factor of organizational management dynamic capability, which in turn has a significant impact on the development of firms' operational capabilities for innovation, specifically innovativeness, innovation strategy, and technological capability. However, the findings only establish that innovation strategy and technological capability have a significant direct effect on export market effectiveness. Implications for scholars and practitioners are discussed along with suggestions for future research.

Keywords: Dynamic capability; Innovation; Export market effectiveness

1. Introduction

It is necessary to research more deeply the relationship between dynamic capabilities, innovation, and firms' export market effectiveness (Weerawardena & Mavondo, 2011). As the export environment becomes more dynamic and uncertain, the need to continuously adapt and innovate becomes imperative for the success of industrial firms (Tomiura, 2007; Yam *et al.*, 2004). Innovation is the key strategic tool to improve market position in such complex environment (Chadha, 2009; Lisboa *et al.*, 2011).

The dynamic capability view suggests that, in order to outperform competitors and ensure continuous innovation, firms must possess dynamic capabilities (e.g., Eisenhardt & Martin, 2000; Teece *et al.*, 1997). They allow firms to upgrade or reconfigure operational capabilities (Helfat & Peteraf, 2003; Hill & Rothaermel, 2003; Zahra *et al.*, 2006) in order to address rapid changes in business environment (Teece, *et al.*, 1997). Firms' competitive advantage results not from dynamic capabilities by themselves, but from the configuration of operational capabilities they

create (Eisenhardt & Martin, 2000; Helfat & Peteraf, 2003; Makadok, 2001; Zollo & Winter, 2002).

Due to emerging technologies, fast changes in customer needs, and accelerated competition, deploying and understanding dynamic capabilities is important for innovation and export contexts (Danneels, 2002; Gebauer, 2011; Teece, 2007; Winter, 2003). Dynamic capabilities require the creation and assimilation of firms continuous innovation in order to respond to the customer needs and technological opportunities (Teece, 2007). On the other hand, innovation involves a constant search for new information, that goes beyond the knowledge related with firms' current operational activities (March, 1991).

Dynamic capabilities are an evolving concept (Newbert, 2007; Rindova & Kotha, 2001), which has to be studied as an integrated model that establishes the connection between its antecedents and its effects (Hung *et al.*, 2010; Wang & Ahmed, 2007). Investigation in this field focuses particularly on conceptual analyses, while empirical studies are still quite sparse (Cepeda & Vera, 2007; Helfat & Peteraf, 2009). In addition, limited research exists about how dynamic capabilities are created, and how they interplay with operational capabilities in order to generate firms' superior value (Weerawardena & Mavondo, 2011; Winter, 2003; Zahra, *et al.*, 2006).

Highlighting these gaps in the literature, we develop an approach that bridges technological turbulence, dynamic capabilities, operational capabilities for innovation, and performance in export markets. In this study, we use one dynamic capability - organizational management dynamic capability (Hung, *et al.*, 2010). We define organizational management dynamic capability as a set of activities that enable firms to upgrade operational capabilities for innovation in order to achieve superior export market effectiveness.

The article is organized as follows. The next section offers the theoretical foundation and the conceptual framework. Then, we describe the empirical procedures and present the results. Finally, we discuss the most important conclusions, implications and limitations of the findings.

2. Theoretical Background and Hypotheses

Innovation capabilities, such as innovativeness, innovation strategy and technological capability are critical for the success of manufacturing firms (Terziovski, 2010; Yam *et al.*, 2010, 2011). They are a kind of special assets that include technology, processes, knowledge, experience and organization (Guan *et al.*, 2006). Innovativeness, innovation strategy and technological capability are related with firm's operational functions, and so they are operational capabilities for innovation (cf., Cepeda & Vera, 2007), that can be further subdivided into specific skills or competences.

Considering that export market and innovation represent a high degree of uncertainty and change, dynamic capabilities are critical for innovation in the export context (e.g., Lee & Kelley, 2008; Lisboa, *et al.*, 2011). Dynamic capabilities enable firms to keep strong and flexible operational capabilities for innovation (Wang & Ahmed, 2007; Zahra, *et al.*, 2006). The improvement of operational capabilities to respond to market changes benefits the way firms operate, and help managers to realize how these improvements can be valuable (Cepeda & Vera, 2007).

One important component of dynamic capabilities is organizational management capability (Hung, *et al.*, 2010). Organizational management dynamic capability allows to develop operational capabilities for innovation (Helfat & Peteraf, 2003; Zahra, *et al.*, 2006) through the flexibility and the alignment of internal capabilities with external demand (Álvarez & Merino,

2003; Camuffo & Volpato, 1996). It focuses on improving existing operational capabilities in order to meet customer needs and finally to enhance performance (Helfat & Peteraf, 2003).

In this study, we intend to demonstrate that organizational management dynamic capability is a response to technological turbulence and that it has a significant impact on operational capabilities on innovation (i.e., innovativeness, innovation strategy and technological capability), which, in turn, contribute to superior export market effectiveness. The conceptual model is presented in Fig. 1.

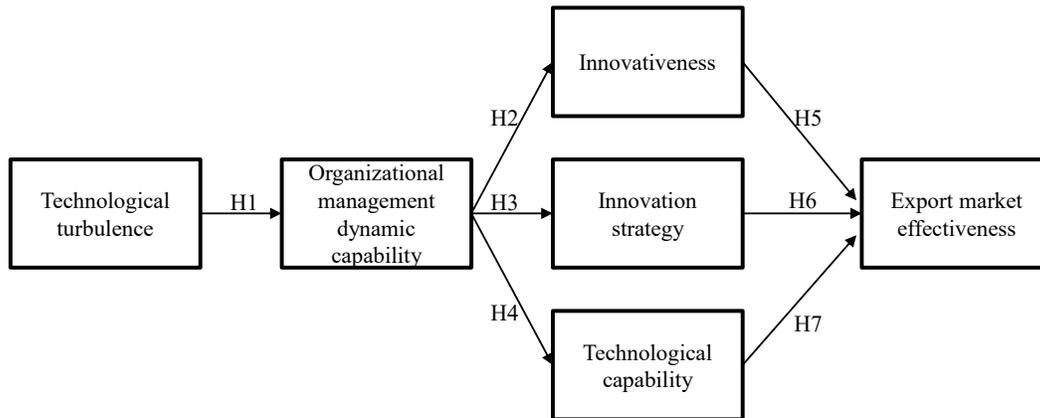


Fig. 1. Hypothesized relationships.

Technological turbulence refers to the extension of technological advances in the industry (Kaleka, 2012). The more dynamic and hostile an environment, the greater the probability of firms to demonstrate organizational management dynamic capability in order to adapt to technological turbulence (Teece, 2007; Wang & Ahmed, 2007).

Hypothesis 1. Technological turbulence positively influences organizational management dynamic capability.

Organizational management dynamic capability keep managers and work teams informed about markets and technologies changes (Camuffo & Volpato, 1996; Teece, 2007). The unexpected situations in the environment, such as customer needs unfilled, or changes in market trends, stimulate a firms' culture of continuous experimentation of new ideas and procedures (Eisenhardt & Martin, 2000; Jong & Hartog, 2007; Zahra, *et al.*, 2006). In addition, the organizational management dynamic capability promotes the knowledge sharing and cooperation between work teams, which leads to synergetic benefits by solving problems that combine this knowledge in innovative ways (Bierly III & Chakrabarti, 1996; Brown & Duguid, 1991). In order to provide solutions to business challenges and problems, managers change routines and develop a culture of innovativeness that is shape to accept high levels of internal change (Teece, 2007; Teece, *et al.*, 1997).

Organizational management dynamic capability leads firms to frequently try out new ideas, new ways to do things, and to be creative in their methods of operation, contributing for the development of innovativeness (Figueiredo, 2003; Teece, 2007).

Hypothesis 2. Organizational management dynamic capability positively influences innovativeness.

Innovation strategy requires firms to focus not only on internal resources and capabilities but also on external links to the market (Grant, 1991; Poon & MacPherson, 2005). The assessment of external factors must precede the formulation of objectives and competitive methods for innovation (Dess, 1987; Khandwalla, 1976). Organizational management dynamic capability, by continually focus on markets and their constantly changes, enable firms to develop the most suitable innovation strategy (Poon & MacPherson, 2005).

Moreover, the implementation of innovation strategy depends on the extent to which different functional departments share and combine resources for realizing such strategy (Tsai & Ghoshal, 1998; Van de Ven, 1986). The interaction between the various functional departments implies to cultivate good working relationships, and accommodate multiple and sometimes even conflicting viewpoints (Cheng *et al.*, 2010; Clercq *et al.*, 2008; Luca & Atuahene-Gima, 2007). Organizational management dynamic capability promotes the communication, coordination, knowledge sharing, and exchange between different functional departments, and thus decrease the risk of potential conflicts (Gatignon & Xuereb, 1997; Xie *et al.*, 1998). Hence, firms with organizational management dynamic capability are better prepared to implement and adopt tools and techniques related to innovation strategy (Nijssen & Frambach, 2000).

Hypothesis 3. Organizational management dynamic capability positively influences innovation strategy.

A central component of technological capability is Research and Development (R&D) activities (e.g., Kyläheiko *et al.*, 2011; Roper & Love, 2002; Zahra, 1996). R&D is the most important intangible expenditure in innovation (Evangelista *et al.*, 1997). Technological capability, such as extensive R&D activities and projects, represent the investment in the creation of technological knowledge that leads to improvement and successful innovation (e.g., Renko *et al.*, 2009; Wang & Kafouros, 2009; Yam, *et al.*, 2010; Yam, *et al.*, 2011; Zhou & Wu, 2010).

Organizational management dynamic capability takes a critical role in the development and accumulation of technological capability (e.g., Figueiredo, 2003; Wang & Ahmed, 2007). This dynamic capability promotes the intra-firm knowledge dissemination, and ensures the creation of new technological knowledge through the continuous interaction of several functional viewpoints and interests (Figueiredo, 2003; Zhou & Wu, 2010). In addition, it stimulates employees' active involvement in internal activities, which leads them to understand the principles underlying the technology and to move on to new actions in response to future market changes (Figueiredo, 2003; Sanchez, 1995). Hence, organizational management dynamic capability leads firms to invest heavily in certain R&D projects, to use the long term know-how in such projects, and to develop superior technological capabilities (Bierly III & Chakrabarti, 1996).

Hypothesis 4. Organizational management dynamic capability positively influences technological capability.

Innovativeness is an important determinant of various performance outcomes, including market position (e.g., Hult *et al.*, 2004; Rhee *et al.*, 2010), financial position (e.g., Calantone *et al.*, 2002), and firm value in the stock market (e.g., Rubera & Kirca, 2012). Firms with a higher culture of innovativeness develop a superior competitive advantage (Hult & Ketchen, 2001), which enable them to reinforce outcomes from it (Damanpour, 1991; Hurley & Hult, 1998). Hence, innovativeness is likely to result in superior export market effectiveness (e.g., Calantone, *et al.*, 2002; Hult, *et al.*, 2004; Rhee, *et al.*, 2010).

Hypothesis 5. Innovativeness positively influences export market effectiveness.

Prior studies have demonstrated that innovation strategy has a great influence in growth and organizational performance of manufacturing firms (e.g., O'Regan *et al.*, 2006; Poon & MacPherson, 2005; Terziowski, 2010). Innovation strategy strengthens behaviors and promotes internal cooperation in the development of innovative activities that, in turn, allow firms to increase their performance (e.g., Akman & Yilmaz, 2008; Hart, 1992). Firms create innovative products that stimulate costumers and outperform competitors, expand their existing markets or create new ones, and achieve distinctive market positions (He & Wong, 2004; Lawson & Samson, 2001). Hence, innovation strategy is expected to enhance export market effectiveness.

Hypothesis 6. Innovation strategy positively influences export market effectiveness.

Technological capability represents the firms' internal effort to create a stock of scientific and technical knowledge (Kyläheiko, *et al.*, 2011; McEvily *et al.*, 2004; Quintana-García & Benavides-Velasco, 2008), that leads to more efficient processes for developing and testing new products and ideas (Criscuolo *et al.*, 2010). Firms with superior technological capability are more innovative (e.g., Martínez-Román *et al.*, 2011), and have a bigger performance (e.g., Coombs & Bierly, 2006; Ortega, 2010). Technological capability allows firms to develop and introduce new products in the market (Renko, *et al.*, 2009), create differentiated and high quality products (Yam, *et al.*, 2010), and have more competitive prices by reducing production cost (Kafouros *et al.*, 2008; Yam, *et al.*, 2010). Hence, technological capability improves competitiveness and leads to superior export market effectiveness (Yam, *et al.*, 2004).

Hypothesis 7. Technological capability positively influences export market effectiveness.

3. Methodology

Data for this study was collected in 2012, using a sample of Portuguese exporting manufacturers. An online questionnaire was the basis of the data used to test the model. The final sample size was 2740 firms. We obtained 471 valid questionnaires, which corresponds to a response rate of 17%. This is a very satisfactory response rate, given that the average top management survey response rates is in the range of 15% to 20% (Menon *et al.*, 1996). Our model includes 35 observable indicators, which determines a 13:1 ratio of sample size to number of free parameters (see Bentler, 1989 in Westland, 2010).

4. Results

In this model, each item was restricted to load on its priori specified factor, with the factors themselves allowed to correlate with one another. The overall chi-square for this model is significant ($\chi^2=286.41$, $df=137$, $p<0.00$). Four measures of fit were examined: the comparative fit index (CFI=0.98), the incremental fit index (IFI=0.98), the Tucker-Lewis fit index (TLI=0.97) and the root mean square error of approximation (RMSEA=0.048). The results suggest that the scale measures were internally consistent, able to provide a good fit of the factor model to the data.

Item reliabilities were assessed examining the loadings of the individual items in the respective constructs. Convergent validity was assessed by calculating the average variance extracted (AVE) (Fornell & Larcker, 1981). Internal consistency was measured by computing the composite reliability (Bagozzi, 1980) (see Appendix).

Discriminant validity was assessed by observing the construct intercorrelations. Table 1 provides an overview of the means, standard deviations, and correlation matrix among the constructs. Adequate discriminant validity is evident since the square root of AVE between any two constructs (diagonal) is greater than the correlation between those constructs (off-diagonal).

Table 1. Means, standard deviations, and correlations among constructs^{a,b}.

Construct	Mean	Standard deviation	1	2	3	4	5	6
1. Technological turbulence	3.8	0.68	0.77					
2. Organizational management dynamic capability	4.0	0.55	0.25	0.71				
3. Innovativeness	4.0	0.65	0.34	0.47	0.78			
4. Innovation strategy	4.0	0.60	0.43	0.54	0.51	0.74		
5. Technological capability	3.5	0.78	0.35	0.48	0.62	0.47	0.76	
6. Export market effectiveness	3.3	0.66	0.13	0.34	0.22	0.26	0.26	0.83

^a All correlations are significant at the 0.05 level.

^b The diagonal (in bold) shows the square roots of the average variance extracted.

The conceptual framework depicted in Fig. 1 was tested using structural equation modeling. The results suggest a good fit of the model to the data ($\chi^2=429.97$, $df=145$, $p<0.00$, $\chi^2/df=2.97$, $CFI=0.96$, $IFI=0.96$, $TLI=0.96$, $RMSEA=0.065$).

Consistent with H1, technological turbulence positively influences organizational management dynamic capability ($\beta=0.41$, $t\text{-value}=6.78$). In line with H2, H3 and H4, organizational management dynamic capability has a significant positive impact on innovativeness ($\beta=0.66$, $t\text{-value}=9.18$), innovation strategy ($\beta=0.72$, $t\text{-value}=9.21$), and technological capability ($\beta=0.66$, $t\text{-value}=9.27$). Contrary to expectations, no significant association is found between innovativeness and export market effectiveness ($\beta=0.04$, $n.s.$), thus H5 is rejected. Finally, consistent with H6 and H7, innovation strategy and technological capability have a significant positive impact on export market effectiveness ($\beta=0.18$, $t\text{-value}=2.66$ and $\beta=0.17$, $t\text{-value}=2.63$, respectively).

5. Discussion and Implications

This study increases the comprehension of the export market effectiveness drawn on the dynamic capability view. We analyze the influence of technological turbulence on the development of organizational management dynamic capability, as well as the impact of this one on the operational capabilities for innovation (i.e., innovativeness, innovation strategy and technological capability), which in turn may result in a higher export market effectiveness.

The findings support the argument that technological turbulence enables firms to create superior organizational management dynamic capability. This is consistent with previous research, that point out that rapid changes in technology and technological breakthroughs in industry influence the development of dynamic capabilities (Teece, 2007; Wang & Ahmed, 2007).

On the other hand, organizational management dynamic capability has a significant impact on operational capabilities for innovation, specifically innovativeness, innovation strategy, and technological capability. This is in line with earlier works that states that dynamic capabilities

enable firms to keep strong and flexible operational capabilities (Wang & Ahmed, 2007; Zahra, *et al.*, 2006).

Taking into account that nowadays industrial exporting firms face a constantly changing environment, characterized by high technological turbulence, the results highlight the need for managers to cultivate organizational management dynamic capability in order to respond to rapid changes in technology. Managers' examination of technological breakthroughs in the industry influences the development of the necessary flexibility to coordinate and improve operational capabilities for innovation, and to align internal capabilities with customers' needs. This way, firms are able to articulate more and upgrade innovativeness, innovation strategy and technological capability.

The study highlights the importance of firms' organizational management dynamic capability in the export context, with an environment open to global competition and characterized by rapid technological changes. Organizational management capability is a dynamic capability that enables firms to respond to technological turbulence while developing the flexibility required for upgrading operational capabilities in order to meet the customers' needs.

This study takes the position that innovation strategy and technological capability are key operational capabilities for achieve a superior performance in export market. When managers develop innovation strategy and technological capability to enhance market performance effectively, they should also develop organizational management dynamic capability in order to improve them. Firms should look for synergies between organizational management dynamic capability and innovation strategy as well as technological capability in order to survive and grow in export markets.

6. Limitations and Directions for Future Research

This study presents some suggestions for future research regarding the theoretical and methodological limitations.

We conceptualized organizational management dynamic capability using three measurement items. Other elements of organizational management dynamic capability could exist and be measure. Research may continue by consulting other scholars' interpretations of dynamic capabilities and/or by using a multidimensional construct of dynamic capabilities. Moreover, it is probable that different industries have different dynamic capabilities. This is also a subject that worth further investigation.

Future research may consider other types of operational capabilities for innovation, such as manufacturing, learning, and resources allocation capabilities, among others. It would be also interesting to analyze the impact of organizational management dynamic capability on these other capabilities.

Longitudinal data may improve this type of investigation, analyzing how organizational management dynamic capability can improve operational capabilities for innovation over time. Because the firm's environment is constantly changing, it is important that future research assess the extent and speed of change that organizational management dynamic capability enables. The cross-sectional data used in this study may not be adequate to observe the short and long-term impact of organizational management dynamic capability on operational capabilities for innovation.

Future studies are encouraged based on samples from various countries, since we only used firms based in Portugal. However, investigation that examines dynamic capabilities in the exporting field was developed with single-country samples (e.g., Chadha, 2009; Lisboa, *et al.*, 2011).

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Appendix. Constructs, scale items, and reliabilities.

Construct/items	Standardized loadings	t-value
Technological turbulence ($\alpha=0.80$, $\rho_{vc}(n)=0.58$, $\rho=0.80$) (adapted from Kaleka, 2012)		
Scale: 1-strongly disagree; 5-strongly agree		
1. The technology in our industry is changing rapidly	0.73	16.65
2. Technological changes provide big opportunities in our industry	0.83	19.29
3. A large number of new product ideas have been made possible through technological breakthroughs in our industry	0.73	16.64
Organizational management dynamic capability ($\alpha=0.72$, $\rho_{vc}(n)=0.51$, $\rho=0.75$) (adapted from Hung, <i>et al.</i> , 2010)		
Scale: 1-strongly disagree; 5-strongly agree		
1. My organization has the flexibility to understand the specific needs of customers	0.73	16.17
2. My organization has the flexibility to communicate and coordinate effectively among departments	0.83	18.70
3. My organization helps employees to balance the life of work and family	0.56	11.93
Innovativeness ($\alpha=0.81$, $\rho_{vc}(n)=0.61$, $\rho=0.82$) (adapted from Calantone, <i>et al.</i> , 2002)		
Scale: 1-strongly disagree; 5-strongly agree		
1. Our company frequently tries out new ideas	0.70	16.22
2. Our company seeks out new ways to do things	0.86	21.21
3. Our company is creative in its methods of operation	0.78	18.55
Innovation strategy ($\alpha=0.77$, $\rho_{vc}(n)=0.55$, $\rho=0.79$) (adapted from Terziovski, 2010)		
Scale: 1-strongly disagree; 5-strongly agree		
1. Internal cooperation is an important part of innovation strategy implementation	0.65	14.26
2. Formulating innovation strategy increases employee skills	0.80	18.47
3. Improving employee commitment, morale, or both is part of our innovation strategy monitoring	0.78	18.02
Technological capability ($\alpha=0.80$, $\rho_{vc}(n)=0.58$, $\rho=0.80$) (adapted from Kyläheiko, <i>et al.</i> , 2011)		
Scale: 1-strongly disagree; 5-strongly agree		
1. Our technological capabilities are top class	0.72	16.47
2. The success of our R&D activities is based on long-term know-how	0.73	16.86
3. We have invested heavily in certain R&D projects	0.82	19.42
Export market effectiveness ($\alpha=0.89$, $\rho_{vc}(n)=0.69$, $\rho=0.90$) (adapted from Morgan, <i>et al.</i> , 2006)		
Scale: 1-much worse than competitors; 5-much better than competitors		
1. Export venture's market share growth	0.86	22.57
2. Growth in export venture sales revenue	0.92	25.13
3. Acquiring new export venture customers	0.76	18.84
4. Increasing sales to current export customers	0.76	18.89

α =internal reliability; $\rho_{vc}(n)$ = variance extracted; ρ =composite reliability.