The Impact of Dynamic Capabilities on Operational Marketing and Technological Capabilities: Investigating the Role of Environmental Turbulence

Ralf Wilden[a]

Siegfried Gudergan[b]

[a]ralf.wilden@newcastle.edu.au (corresponding author), Tel: +61-2-8262-6416, Newcastle Business School, University of Newcastle, University Drive, Callaghan NSW 2308, Australia

[b]siggi.gudergan@newcastle.edu.au, Tel: +61-2-4921-5045, Fax: +61-2-4921-6911, Newcastle Business School, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia

Paper published in *Journal of the Academy of Marketing Science*. Please cite as:

Wilden, R.M. & Gudergan, S. 2015, 'The impact of dynamic capabilities on operational marketing and technological capabilities: investigating the role of environmental turbulence', *Journal of of the Academy of Marketing Science*, vol. 43, pp. 181-199.

The Impact of Dynamic Capabilities on Marketing and Technological Capabilities: Investigating the Role of Environmental Turbulence

ABSTRACT

Marketing and technological capabilities are primary drivers of a firm's performance and thus of central interest to managers. Yet the way in which these two capabilities align with changing environments to secure superior performance remains unclear. Drawing on the dynamic capability view and data from a survey of 228 firms, this study proposes a model of how frequent dynamic capability utilization, assessed through its underlying processes of sensing and reconfiguring, relates to marketing and technological capabilities, as well as how market, technological, and competitor turbulence might affect these relationships. The results show that frequent sensing and reconfiguring have stronger positive effects in environments characterized by high competitor turbulence; however, frequent sensing can have negative relationships with marketing and technological capabilities in stable environments. Furthermore, marketing capabilities are positively associated with firm performance in highly competitive environments, whereas technological capabilities link to performance in stable competitive environments.

Keywords: Marketing Capabilities; Technological Capabilities; Market Sensing; Reconfiguring; Dynamic Capability; Environmental Turbulence; Partial Least Squares; FIMIX-PLS

Introduction

Market-based and technological resources (e.g., brands, IT systems) and capabilities (e.g., marketing expertise, IT maintenance) contribute significantly to a firm's total market capitalization (Ramaswami et al. 2009). Yet valuable marketing and technological capabilities may become liabilities when firms face environmental turbulence (Leonard-Barton 1992), especially if capability gaps arise (Day 2011). In such cases, dynamic capabilities become important, because they reflect "the firm's ability to engage in market-based learning and use the resulting insight to reconfigure the firm's resources and enhance its capabilities in ways that reflect the firm's dynamic market environment" (Morgan 2012, p. 108).

Take the example of the BMW Group. To benefit from changes in their marketing and technological environments, BMW established the department Marketing Innovation and the subsidiary BMW Group Research and Technology to stay ahead of competition. The former department—separate from the operational marketing department—may be described as the group's R&D center for marketing, aimed at identifying and responding to current trends and future developments that affect their marketing. It represents BMW's dynamic capability in this area. The department engages in structured and frequent sensing activities through, for example, collaborations with universities and attendance at trend workshops. To understand whether relevant changes in their customer and competitive environment have long-term and strategic implications or are just short-term hypes, they frequently engage in these sensing processes so that they can react to those changes that are relevant. These responses comprise frequent pilot projects and adaptations to BMW's marketing capabilities by creating, for example, the group's first social media programs. Trial projects are only run once and, if successful, are implemented in their day-to-day marketing repertoire across the group, representing a reconfiguration of

BMW's operational marketing capabilities. For instance, frequent experimenting with novel marketing initiatives ultimately led to the launch of mobile marketing platforms (e.g., BMW TV and podcasting) ahead of competition, generating new customer leads and thus increasing BMW's marketing ROI. Similarly, BMW Group Research and Technology engages only in non-traditional R&D to sense new technological developments and future mobility. Through a portfolio of projects BMW senses technological opportunities, which when relevant results in reconfiguring their technological capabilities involving, for example, hiring experts in the areas of hybrid and hydrogen technologies (CleanEnergy and Efficient Dynamics) and mobile services (Connected Drive), and collaborating with external partners (e.g., mobile service providers). In turn, they improve functionality of their cars by integrating, for instance, driver assistance and internet services. The frequent use of these dynamic capabilities has, for example, resulted in the introduction of the revolutionary BMW i3 and i8 electric cars with revised business model, predicted to lead the firm into the future and show a significant ROI.

Despite research into how marketing and technological capabilities affect performance, we still lack a sufficient understanding of how real-world firms can align these capabilities with the changes in their environment (technological, competitor, and market conditions), as well as how frequent dynamic capability utilization might facilitate this capability alignment. This gap in marketing strategy literature demands stronger theory and tests of potential methods for improving marketing capabilities (Vorhies et al. 2011). Although previous studies have investigated the moderating role of turbulence on the relationship between dynamic capabilities and performance (e.g., Wu 2010), no study has determined whether the use of dynamic capabilities, in the form of sensing and reconfiguring processes, has varying effects on marketing and technological capabilities in distinct environmental conditions. Firms deploy these processes

purposefully to align their resources and capabilities with environmental conditions, so their performance effects are mediated by the resource base (Zahra et al. 2006). Finally, research that aggregates market, technology, and competitive turbulence into a composite measure neglects the fine-grained effects of dynamic capabilities in varying conditions.

By addressing these issues, this study makes three main contributions. First, unlike previous research that has focused on the development or existence of dynamic capabilities, we offer a clearer understanding of the utilization of processes that underlie capability alignment. Specifically, we derive and empirically test a conceptual model of the impact of the *frequency* of dynamic capability utilization, in the form of sensing and reconfiguring, on marketing and technological capabilities. We integrate the dynamic capability view of the firm, from organizational strategy, in order to advance marketing strategy thought by illustrating the need and processes for modifying marketing capabilities when competitive turbulence is high.

Second, we outline how environmental turbulence, assessed through market, competitor, and technological turbulence, can exert different effects on a firm's attempts to align its capabilities. Previous studies have discussed the moderating effect of environmental turbulence using an aggregate measure (e.g., Protogerou et al. 2012), which has limited the available insights and prevented a clear view of the more fine-grained interaction effects across dimensions of environmental turbulence and dynamic capabilities. We theorize that the three types of turbulence may induce a capability gap between a firm's existing configuration of marketing and technology capabilities and their value-maximizing configuration in a changed environment. In response to such a capability gap, a firm likely deploys its dynamic capabilities to identify the value-maximizing capability configuration. Yet the extent to which it dedicates its attention to closing a possible capability gap depends on the anticipated performance

consequences of that particular gap. This attainment discrepancy explanation helps clarify an important behavioral assumption inherent to the dynamic capabilities view.

Third, we provide specific empirical insights regarding the impact of dynamic capabilities and their role in aligning marketing and technological capabilities. Dynamic capabilities and their effects are difficult to measure (Easterby-Smith et al. 2009; Kraatz and Zajac 2001), so most research examining dynamic capabilities has remained largely theoretical. Even some recent empirical research deals mainly with the evolution of dynamic capabilities (e.g., Narayanan et al. 2009; Zhou and Li 2010), often in the form of case studies (e.g., Danneels 2010). Our results provide new empirical insights about marketing strategy performance and contribute to the strategy conversation between marketing and management researchers (Yarbrough et al. 2011). Specifically, we identify that firms benefit most from the frequent use of dynamic capabilities when they face high competitor turbulence and from dedicating their focus to marketing capabilities in turbulent environments. In contrast, when operating in less turbulent environments, leveraging technological capabilities is more beneficial.

In the next section, we describe the theoretical background and resulting hypotheses. In presenting our research approach, we detail the sample selection and description, measures, and analysis procedure. We then present findings of a survey of 228 senior managers, before concluding with a discussion of the findings and implications for theory and practice.

Theoretical framework and hypotheses

As we detail in Table 1, previous research indicates that both technological (e.g., Song et al. 2005; Zhou and Wu 2009) and marketing (e.g., Hooley et al. 2005; Srivastava et al. 1998; Vorhies and Morgan 2005) capabilities relate positively to firm performance. Technological

capabilities reflect the organizational capacity to employ technologies to convert inputs into outputs (Afuah 2002). They lie upstream of any goods or services (Danneels 2007), can be used for different purposes, and can be combined with different resources to create goods or services (Penrose 1959). Yet they are insufficient to generate market success on their own; to leverage technological capabilities, firms must draw on complementary marketing capabilities (Thomke and Kuemmerle 2002; Tripsas 1997). These capabilities reflect an organizational capacity to link with and serve particular customer groups (Danneels 2008; Day 1994; Song et al. 2005). They allow firms to create advantageous relationships with customers, maintain established customer bases, and use market knowledge to their advantage (Spanos and Lioukas 2001). The two operational capabilities also have complementary performance effects (Prasnikar et al. 2008).

However, beneficial marketing and technological capabilities might not remain valuable if environmental conditions change. Failing to align capabilities with changed conditions can lead to capability gaps and ultimately result in obsolescence or even core rigidity (Leonard-Barton 1992). In line with the dynamic capability view, we therefore argue that the frequency of use of dynamic capabilities—in the form of sensing and reconfiguring—strengthens both marketing and technological capabilities. We further explore how market, technological, and competitor turbulence affect the impacts of sensing and reconfiguring processes on marketing and technological capabilities, as illustrated in Figure 1.

Table 1 & Figure 1 here

Dynamic capabilities: Sensing and reconfiguring

Dynamic capabilities support the alignment of marketing and technological capabilities with market conditions (Danneels 2008; Protogerou et al. 2012), which can lead to performance

differentials. We investigate not whether the sheer existence of dynamic capabilities affects marketing and technological capabilities but rather whether their *frequent* use has an impact. For this analysis, we focus on the sensing and reconfiguring processes that underlie dynamic capabilities (Eisenhardt and Martin 2000; Jantunen et al. 2005; Teece 2007; Zahra et al. 2006). Sensing involves search and exploration across technologies and markets (Teece 2007), such that it reflects the organizational capacity to learn about customers, competitors, and the broader market environment (Day 1994). It can be exercised using a variety of processes, such as maintaining relationships with customers, suppliers, and universities; participating in professional associations; and observing best practices. After sensing market opportunities, the firm may need to reconfigure its capabilities, to align them with environmental conditions (Jantunen et al. 2005; Teece 2007). Reconfiguring entails extending and modifying capabilities in response to changes in the market and technologies (Collis 1994; Teece 2007; Winter 2003).

These processes develop and improve through learning from repeated trials (Cohen and Levinthal 1990; Zahra and George 2002). The more frequently firms engage in sensing and reconfiguring, the more their dynamic capabilities improve and become embedded in organizational memory (George 2005). Such learning then leads to a stronger effect of dynamic capabilities on operational capabilities (Zollo and Winter 2002). That is, the frequent use of dynamic capabilities is self-reinforcing and decreases the variability in outcomes. In particular, sensing processes produce inputs for the specifications of reconfigured operational capabilities (Eisenhardt and Martin 2000), so repeated sensing implies learning about various characteristics of the environment (e.g., altered customer preferences, technological advances; Teece 2007) and related opportunities and threats (Daft et al. 1988). The more frequently the firm engages in

sensing, the more frequently it is stimulated to react by exploring and specifying new capability configurations that ultimately can change its marketing and technology capabilities.

H1: Frequent engagement in sensing processes relates positively to frequent engagement in reconfiguring processes.

Firms that frequently exercise sensing processes can increase their market knowledge and understanding of both underserved market segments (Slater and Narver 2000) and their existing customer base (Morgan et al. 2005). Because these firms recognize, for example, the need to establish new cross-selling routines to leverage their customer relationships, their frequent use of sensing processes should improve their marketing capabilities. Enhanced market knowledge stocks also benefit overall firm performance (Kohli and Jaworski 1990; Narver and Slater 1990), through the firm's marketing capabilities (Barney 1991; Day 1994). Through frequent sensing, firms can also detect technological advances earlier (Cohen and Levinthal 1990). Their potentially greater technical expertise thus should strengthen their technological capabilities, such that they might develop more effective operations or modified routines for exploiting new technologies to convert inputs into outputs more efficiently. Their enhanced technological and market understanding, through frequent uses of sensing processes, then should trigger reconfiguration processes, such as exploring and specifying new capability configurations that can establish concrete marketing and technology capabilities and reduce organizational inertia (Levinthal 1991). In contrast, firms that lack understanding of their necessary capability reconfigurations will struggle to align their capabilities (Helfat et al. 2007).

H2: Frequent sensing relates positively to (a) marketing capabilities and (b) technological capabilities.

H3: Frequent reconfiguring relates positively to (a) marketing capabilities and (b) technological capabilities.

Moderating roles of market, competitor, and technological turbulence

In stable environments, external changes exist but tend to be predictable and incremental, with low rates of change (Duncan 1972). Dynamic capabilities still can play a minor role, but operating capabilities generally remain in place. In contrast, fast-paced, unpredictable, turbulent environments create the substantial risk of obsolescence for operating capabilities (D'Aveni 1994), so they demand the frequent use of dynamic capabilities to maintain the competitiveness of the firm's existing marketing and technological capabilities.

Market, competitor, and technological turbulence relate to firm capabilities in three ways. First, the changing characteristics of competitive, market, or technological environments create altered operating spheres and thus a new range of methods for generating value. The extent of this turbulence determines the range and set of conceivable capability configurations (Nagarajan and Mitchell 1998). Moreover, the characteristics of possible future environments denote the extent to which alternative configurations will be valuable (Barney 1991). Because environmental turbulence can "influence the capability gap between the actual configuration of each capability and the corresponding value-maximizing configuration, which refers to the most valuable capability configuration potentially available in the postchange environment" (Lavie 2006, p. 155), its level determines the extent to which the firm can improve its capabilities. Firms facing stable environments experience smaller capability gaps than do those operating in turbulent environments. When they confront more turbulence, firms also gain indispensable opportunities to reconfigure their marketing capabilities, technological capabilities, or both.

Second, in response to a capability gap, a firm likely engages in sensing and reconfiguring, to identify value-maximizing capability configurations that provide the fundamental basis for its implementation of marketing and technology capabilities. The frequent use of dynamic capabilities enhances their impact, by fostering variety in learning, such that firms can consider a wider range of possible capability reconfigurations (Moorman and Miner 1997; Tushman and Anderson 1986). Filling a capability gap in turbulent environments requires firms to specify novel capability reconfigurations. The more frequently firms use sensing and reconfiguring processes, the greater their marketing and technological capabilities should be, especially if they operate in turbulent environments.

Prior research at this aggregate level implies that turbulent environments demand timely, relevant information if the firm is to maintain the alignment of its marketing and technological capabilities with the external environment (Baum and Wally 2003; Glazer and Weiss 1993). Thus, frequent sensing should reveal a stronger positive relationship with marketing and technological capabilities in turbulent, compared with stable, environments. Also, in turbulent environments, firms tend to rely on external knowledge, which increases the importance of sensing processes and thus of dynamic capabilities (Droge et al. 2008; Narasimhan et al. 2006). Frequent sensing and the addition of knowledge stocks to operational capabilities likely have less positive impacts in stable environments. Instead, stable environments tend to reward consistent exploitations of existing capabilities (Leonard-Barton 1992; Teece 2007), so reconfigurations of technological and marketing capabilities likely occur only if a capability gap exists. We predict that the positive association of frequent dynamic capability use with marketing and technological capabilities thus disappears in more stable environments (Schilke 2014).

Because previous research has investigated the relationship between dynamic capabilities and environmental turbulence chiefly at an aggregate level, we lack a good understanding of how dynamic capabilities might differ in their effects, depending on the type of turbulence. To add more nuance to extant research, we consider market, competitor, and technological turbulence separately. First, we expect market turbulence—defined as the rate and predictability of change in customer segments and their preferences (Hanvanich et al. 2006)—to moderate the relationship of sensing and reconfiguring processes with marketing and technological capabilities. Firms operating in environments characterized by high levels of market turbulence likely require reconfigurations of their marketing capabilities to satisfy altered customer needs (Jaworski and Kohli 1993). Those operating in stable market environments are less likely to require such modifications. High market turbulence with rapidly changing customer needs prompts firms to learn about the changes through frequent sensing; they also need to frequently specify reconfigurations of their marketing and technological capabilities (Hanvanich et al. 2006). Thus, firms in turbulent, compared with stable, markets should benefit more from frequent sensing and reconfiguring activities, to align their marketing and technological capabilities with difficult to predict changes in customer requirements.

Second, competitive turbulence—reflecting the rate and degree of predictability of a changing competitive landscape (Auh and Menguc 2005)—puts firms at risk of losing their resource advantages (Ferrier et al. 1999; Sirmon et al. 2010) and performance strengths. Thus firms need to adapt their capabilities to take advantage of opportunities and deal with threats when facing strong competition (Makadok 2001). In such environments, sensing and reconfiguring become more valuable because of the increase in causal ambiguity (Helfat et al. 2007). That is, other firms have difficulty understanding the focal firm's use of sensing and

reconfiguring processes and are unable to imitate their outcomes, in the form of better alignment of marketing and technological capabilities with environmental conditions. In contrast, when faced with little competitive turbulence, firms may perform well, independent of whether they reconfigure their capabilities or engage frequently in sensing and reconfiguring processes (Auh and Menguc 2005; Kohli and Jaworski 1990).

Third, previous research is inconclusive regarding how technological turbulence—defined as the degree and predictability of change associated with product and process technologies in an industry (Hanvanich et al. 2006)—affects the relationship between dynamic capabilities and marketing and technological capabilities. Teece (2007) suggests that dynamic capabilities become more important at higher degrees of technological turbulence, because it requires firms to combine multiple inventions and recombine existing technologies. Marketing capabilities can reduce the uncertainty caused by technological turbulence, and these capabilities improve when firms scan customer demands, competitor actions, and technological advancements frequently (Li and Calantone 1998). Therefore, greater technological turbulence increases the importance of frequent scanning for the firm's marketing capabilities (Calantone et al. 2003). Accordingly, we expect that the frequency of sensing and reconfiguring has stronger relationships with marketing and technological capabilities in turbulent market, competitive, and technological environments than in stable ones.

H4: Greater (market, competitor, and technological) turbulence amplifies the positive relationship of frequent sensing with (a) marketing capabilities and (b) technological capabilities.

H5: Greater (market, competitor, and technological) turbulence amplifies the positive relationship of frequent reconfiguring with (a) marketing capabilities and (b) technological capabilities.

Notwithstanding these generally positive hypothesized moderating effects, we argue that their extent may differ according to the type of turbulence a firm faces; this variance represents a third way that environmental turbulence relates to firm capabilities. As we noted, firms deploy their dynamic capabilities more or less frequently to specify reconfigurations of their marketing and/or technological capabilities and devise a potential solution to a capability gap. The extent to which turbulence affects the association between marketing and technological capabilities and the frequent use of dynamic capabilities depends on the prevalent pressures. We argue that different sources of capability gaps (i.e., market based, technology based, or competitor based) alter the types of attention directed toward closing a capability gap.

Attention shifts depend on the anticipated performance, relative to a particular goal (Greve 1998, 2002, 2008; March and Shapira 1992). Goals that are closely associated with the survival of a firm have higher priority than others (Greve 2008), as expressed in the sequential attention rule (Cyert and March 1963). According to the dynamic capability view, firms seek to enhance their growth and secure their survival (Teece 2007). Greater competitive intensity puts firm growth and survival at risk: if competition is fierce, firms could lose market share and sales, which at the extreme would threaten their survival. Chen et al. (1992) find that the greater the threat presented by a rival's action, the more likely and the faster a firm responds. Thus firms should pay more attention to closing capability gaps induced by competitor turbulence. In contrast, the capability gaps induced by market and technological turbulence pose a less immediate threat to survival and are less salient; competitors need to adapt their capabilities in

response to such forms of turbulence too. That is, only relative to existing and presumed competitor capabilities can the characteristics of future firm environments determine the value of alternative capability configurations (Barney 1991) and threaten relative firm performance that falls below an aspired performance level. Firms implement strategic changes in response to these possible relative performance shortfalls (Haleblian et al. 2006; Lant et al. 1992). Nadkarni and Barr (2008) also suggest that radical shifts in external environments may lead managers to change their patterns of attention.

In conjunction with this argument, we posit that attention induced through competitor turbulence results in less attention being paid to market and technological turbulence, due to the limited managerial resources available to a firm (Penrose 1959). We thus predict that firms react more strongly to competitor turbulence than to turbulence in markets and technologies. These differential moderating impacts in turn suggest that turbulence, in general, positively moderates the association of frequent uses of sensing and reconfiguration processes with marketing and technological capabilities (H4 and H5) but that actual operational capabilities depend on not only reconfiguration specifications (i.e., through the use of dynamic capabilities) but also the pressure or immediacy of a particular capability gap and the attention it attracts. The extent to which competitive turbulence enhances the impact of frequent dynamic capability use therefore should be greater than that induced by market or technological turbulence.

H6: The positive moderating effect of competitive turbulence on the positive relationships of (a) sensing and (b) reconfiguring with technological capabilities is greater than the moderating effects of market turbulence or technological turbulence.

H7: The positive moderating effect of competitive turbulence on the positive relationships of (a) sensing and (b) reconfiguring with marketing capabilities is greater than the moderating effects of market turbulence or technological turbulence.

Research methodology

Sample and procedure

To investigate our hypotheses, we collected survey data from a sample of firms located in Australia. Prior to administering the survey, we pretested the instrument intensively by conducting 16 in-depth interviews with senior managers and three experienced researchers to verify the content, clarity, and wording of the items (DeVellis 2003), followed by a pilot study. The sample came from Dun & Bradstreet's database (n = 2,747) and was representative of Australian businesses (ABS 2004). The firms varied in size, and no industry dominated the sample. Therefore, we ensured sufficient variation in the firm environments and capabilities. We excluded diversified firms, whose divisions likely have different sensing and reconfiguring processes and marketing and technological capabilities, such that company-wide generalizations would be inappropriate. We focused on large firms (Miller 1987) with annual sales volumes of at least US$20 million and 150 employees (Henri 2006), as they tend to have formal, codified policies in place. As key informants, we chose senior managers, who possess knowledge about tacit organizational processes that are difficult to observe (Chen et al. 1993). A key informant approach is appropriate for our study, because no archival data describe organizational-level constructs such as capabilities (Kumar et al. 1993). After contacting potential respondents by phone to invite them to participate, we e-mailed them the surveys, and then sent three reminders in November and December 2008. We promised all respondents a research report and a donation

to charity on their behalf (Cycyota and Harrison 2006). We obtained 228 usable survey responses (with negligible missing data), for a response rate of 8.3%. Considering the length of the survey and the seniority of the respondents, this response rate was as expected and comparable to similar studies (Chmielewski and Paladino 2007; Hanvanich et al. 2006).

We compared respondents and non-respondents from the sampling frame by running Mann-Whitney U-tests on three key variables: number of employees, market performance (i.e., sales), and firm age (the data came from Dun & Bradstreet's database). The results indicated no significant differences. We also compared early with late respondents by running Mann-Whitney U-tests on all included items and, where available, objective variables. Only 1 of 38 items indicated a significant difference, so we are not concerned about a non-response bias. On average, the responding firms employed 1,155 staff, with sales ranging from US$20 million to more than US$1 billion, with an average firm age of 28 years. In addition, 74.6% of respondents were general managers (e.g., managing director, CEO), 4.8% had a commercial function (e.g., vice president of sales, marketing, or new business development), and 1.7% performed technical functions (e.g., director of R&D or manufacturing/operations). The remaining respondents provided titles such as chairperson or corporate strategist. To verify the appropriateness of these key informants, we measured their experience; on average they had overall work experience exceeding 20 years, 5–10 of which had been spent with the focal firm.

To minimize informant bias, we sampled respondents with similar roles in their respective firms and assured them of the confidentiality of their responses (Heneman 1974; Kumar et al. 1993). To alleviate common method bias concerns, we used an effective questionnaire design, guaranteed respondent confidentiality, and reduced item ambiguity (i.e., pilot tests; Podsakoff et al. 2003). We also applied Harman's single-factor test by entering the

study variables into a principal components factor analysis. The results indicated no common method concerns (Lane et al. 2001). Next, we adopted a common method variable approach to assess this possibility further (Podsakoff et al. 2003). In line with Sattler et al. (2010), we used a latent common method factor to estimate the loadings on every item in the PLS path model, in addition to each item's loading on its theoretical construct. Comparing the estimated path model relationships with and without each additional marker variable, we found no notable differences; all conceptualized paths maintained their statistical significance. Furthermore, common method variance was unlikely to be a major concern for our study, because we investigated a moderating effect, so the respondents probably could not predict or manipulate their responses related to interaction effects (Dayan and Di Benedetto 2010).

Measurement

Measurement specification requires operationalizing measurement models as either reflective or formative (Bollen and Lennox 1991); this choice in turn guides the selection of appropriate methods for subsequent data analysis and reliability and validity assessments (Diamantopoulos and Winklhofer 2001). To make these selections, we followed the logic of Jarvis et al. (2003) and also conducted intensive reviews of relevant studies and pretests with senior managers.

Reconfiguring We assessed the reconfiguring processes using a seven-item reflective measurement scale (Jantunen et al. 2005). This scale measured activities, such as the implementation of new strategies, adoption of new management methods, and renewal of

business processes within the previous four years (2004–2008). The frequency of each activity was assessed on a seven-point interval scale, ranging from "rarely" to "very often."[1]

Sensing Sensing was measured with a five-item reflective scale, based on Danneels (2008), Jantunen et al. (2005), and Teece (2007). We created a pool of items by reviewing existing literature to capture the relevant dimensions. Items focused on activities that enable the firm and its employees to learn from the environment, such as participation in professional association activities and attendance at conferences. The frequency of each activity was assessed on a seven-point interval scale, ranging from "rarely" to "very often."

Operational capabilities We asked respondents to rate the strength of their firm's marketing and technological capabilities relative to their competitors' at the time of the survey in 2008 (five-point reflective interval scale, ranging from "much weaker than competitors" to "much stronger than competitors"), as well as indicate the level of improvement over the previous three years (five-point reflective interval scale, ranging from "much weaker" to "much stronger"). We measured marketing and technological capabilities in accordance with Spanos and Lioukas's (2001) seven-item measurement scale. Self-reported measures of a firm's capabilities relative to competitors' are well accepted (e.g., Danneels 2008; DeSarbo et al. 2005).

Environmental turbulence We measured technological turbulence by assessing the speed and frequency of technological change, the extent of technical opportunity, and the difficulty of technological forecasting. The assessment of market turbulence was based on evaluating changes

[1] In their original scale, Jantunen et al. (2005) counted the number of renewals as the sum of the activities performed, ranging from zero to seven. Because we were interested in a more fine-grained assessment, we used a seven-point interval scale, ranging from "rarely" to "very often."

in customer preferences, ease of forecasting marketplace changes, and changing customer bases. The competitive turbulence index assessed the general degree of competition, extent of promotion and price wars, ability of firms to match competitive offers, and rate of competitive moves. The actual index represents an adapted version of DeSarbo et al.'s (2005) and Wilden et al.'s (2013) reflective scales. However, these triggers of turbulence are distinct and can vary independently, so we included the items in formative mode (as also suggested by our interviews with senior managers in the pretest). They provided the defining characteristics of the respective constructs, and not all items were interchangeable, so dropping items would likely alter the conceptual domain of the construct. Furthermore, we did not expect the implied dimensions of predictability and rate of change to co-vary or have the same antecedents; an industry may change frequently but at predictable times and in regular ways (Jarvis et al. 2003). The three dimensions were measured with four items each, anchored at "strongly disagree" and "strongly agree."

Performance Firm performance is a complex construct (Chakravarthy 1986). Because the majority of firms in our dataset were not listed and thus not required to provide financial statements, we used perceived measures to assess firm performance in terms of market performance (four items) and profitability (three items), based on an established reflective scale (Spanos and Lioukas 2001). Senior managers assessed their firms' performance relative to their competitors' for the past three years. Using stated performance measures is a common practice in strategy-related research when financial data are unavailable (e.g., Powell 1992). Previous research also has indicated high correlations between objective and subjective performance measures (Dess and Robinson Jr 1984). Although self-reported performance scales might be

criticized in terms of their validity, their use enabled us to draw comparisons across firms and contexts, such as different industries and sectors (Song et al. 2005).

Control variables We also included several control variables: firm size, firm age, and industry membership. Firm size was assessed as the number of employees and sales volume (Danneels 2008; Garg et al. 2003; Jantunen et al. 2005). We transformed employees and sales using natural logarithms to account for nonlinear effects. Larger and older firms tend to be less flexible and consequently less capable of altering their capabilities, which may affect sensing and reconfiguring activities and ultimately firm performance (e.g., Chandy and Tellis 2000). Also, research has indicated that a firm's size may systematically influence its operational capabilities and performance (Baum and Wally 2003; Garg et al. 2003). We also included industry membership as a control variable, assessed with the standard industry classification codes provided by Dun & Bradstreet. We created two effect-coded variables, representing service-only and manufacturing-only firms, with mixed firms as the reference category.

Construct and measurement scale validation

We assessed the validity and reliability of the reflective measures in multiple ways. To assess convergent validity, we evaluated Cronbach's α, average variance extracted (AVE), factor loadings, and composite reliability. For all constructs, the Cronbach's α and factor loadings reached values above the required thresholds of .7 and .5, respectively, for exploratory research (Fornell and Larcker 1981; Nunnally 1978). The composite reliability was above the required threshold of .7 too. The AVE surpassed the threshold of .5 for all constructs (Hair et al. 2011). To test whether constructs differed sufficiently, we inspected their discriminant validity using

Fornell and Larcker's (1981) criterion, which requires a construct's AVE to be larger than the square of its largest correlation with any construct. Our constructs met this requirement. These tests provided confidence in the use of our reflective measurement models (see Tables 2 and 4).

Internal consistency and convergent validity are not applicable validation measures for formative indices (Bollen and Lennox 1991). Instead, to demonstrate construct validity, we tested for multicollinearity using the variance inflation factor (VIF) (Diamantopoulos and Winklhofer 2001). The results did not indicate any problems; the VIF values were well below the cut-off value of 5 (Table 2) (Hair et al. 2006). We also checked the condition indices to identify multicollinearity, and all values were less than 30 (Hair et al. 2011). By applying a bootstrapping procedure, we established the significance of the index weights. We tested for nomological validity by linking each index to the constructs it was expected to link with; the direction of the relationships was reasonable in the context of the proposed model (Diamantopoulos and Winklhofer 2001). Because of the intensive pretesting with academics and practitioners, all constructs had high expert validity. Thus, the measures are appropriate (see Table 3). Finally, the correlations between the constructs did not raise any concern (see Table 4).

Tables 2-4 here

Analytical procedure

We analyzed the data using partial least squares structural equation modeling (PLS-SEM), employing SmartPLS (Ringle et al. 2005b).[2] We chose PLS-SEM for several reasons. First, PLS-SEM is a soft-modeling approach (Wold 1980), which is less appropriate for testing well-

[2] For reviews of the increasing use of PLS-SEM in marketing, strategy, and management information systems research, see Hair et al. (2012), Hair et al. (2013), and Ringle et al. (2012).

established theories (Hair et al. 2012) but is advantageous for examining predictive research models in the early stages of theory development (Fornell and Bookstein 1982), as in our study. To date, only limited theory has emerged regarding how marketing and technological capabilities align with the environment (Vorhies et al. 2011). Second, PLS-SEM can include both reflective and formative measurement modes, whereas covariance-based SEM suffers limitations on this point (Chin 1998; Henseler et al. 2009). Third, PLS-SEM exhibits higher statistical power than covariance-based SEM for complex models with limited sample sizes (Reinartz et al. 2009), which is relevant for this study with its small subgroup sizes. Power analysis using D*Power 3.1 (Faul et al. 2009), for both the full sample and subgroups, exhibited high statistical power above the cut-off of .8 (Cohen 1988), which increased our confidence in the findings.

Results

Main findings

We started by investigating the direct effects of the model, without accounting for the hypothesized moderating effects. To test the model's explanatory power regarding the frequency of sensing and reconfiguring processes on marketing and technological capabilities, we examined the coefficient of determination (R^2). For the full sample, the R^2 values were as follows: marketing capabilities .18, technological capabilities .19, reconfiguring .20, and firm performance .33. Thus, they were acceptable (Chin 1998).[3]

Next, we examined the path coefficients and their significance values to test the hypotheses, and we used a bootstrapping procedure (500 samples; 228 cases) to evaluate the significance of paths (Nevitt and Hancock 2001). In support of H1, we found a positive

[3] According to Hair et al. (2012), acceptable R^2 levels depend on the research context. From a review of similar studies that have investigated capabilities and performance using PLS-SEM (e.g., Lew and Sinkovics 2013; Sarkar et al. 2001), we concluded that our coefficients of determination were acceptable.

relationship between sensing and reconfiguring (β = .44, $p < .01$). The results further revealed significant, positive relationships of sensing with marketing (H2a, β = .16, $p < .05$) and technological (H2b, β = .22, $p < .01$) capabilities. Furthermore, we identified positive relationships of reconfiguring with marketing (H3a, β = .33, $p < .01$) and technological (H3b, β = .30, $p < .01$) capabilities. Both marketing (β = .24, $p < .01$) and technological (β = .39, $p < .01$) capabilities exerted positive effects on firm performance. We found little indication that the control variables had any significant effects; because firm age, industry, and firm size did not directly affect our hypothesized effects, the finding lent further credence to H1–H3.

We then proceeded to test the mediating effects of marketing and technological capabilities on the link between the two dynamic capability processes and firm performance. For tests of mediation effects, PLS performs well (Bontis et al. 2007); it is best combined with a causal steps approach based on regression analysis. Path coefficients generated by PLS provide an indication of relationships and can be applied similar to traditional regression coefficients (Gefen et al. 2000). Following Bontis et al. (2007), we adopted a four-step approach to test for mediation. First, sensing and reconfiguring exerted significant direct effects on performance (β = .16, $p < .05$; β = .27, $p < .01$, respectively). Second, when we included marketing and technological capabilities as mediators in the model, the results indicated that the two dynamic capability processes had no significant direct effects on performance (β = .06, $p > .10$; β = .09, $p > .10$, respectively) but significant effects on marketing and technological capabilities. Third, marketing and technological capabilities revealed significant relationships with performance (β = .35, $p < .01$; β = .21, $p < .01$, respectively). Therefore, marketing and technological capabilities fully mediated the dynamic capabilities–performance relationship.

Moderating analysis

To test H4–H7, we used finite mixture partial least squares (FIMIX-PLS) (Hahn et al. 2002). *A priori* subgroup analyses (e.g., those based on latent variable scores of environmental turbulence) might not provide the most appropriate segmentation result, because heterogeneity could be unobservable; observations cannot necessarily be separated easily into subpopulations (i.e., the procedure to create subgroups by pre-specifying subgroup sizes and predetermining levels for separating markets might not distinguish suitably different levels of turbulence within an environment). Observable characteristics often are inadequate to capture heterogeneity in data (e.g., Wedel and Kamakura 2000), but ignoring heterogeneity can lead to biased parameter estimates and potentially flawed conclusions. Therefore, we used FIMIX-PLS, which can provide more differentiated results by accounting for unobserved heterogeneity (Hahn et al. 2002). It represents the primary choice for segmentation tasks in a PLS context (Sarstedt 2008), because as a response-based segmentation approach, it enables the effective identification of subgroups (Rigdon et al. 2010) and can classify data on the basis of heterogeneity in the inner path model estimates (Ringle et al. 2005a). In this sense, FIMIX-PLS combines the advantages of PLS path modeling with the advantages of classifying groups by finite mixture models

We ran the FIMIX-PLS algorithm on the data 10 times each, using consecutive numbers of groups *g* (Sarstedt and Ringle 2010). Following Sarstedt et al. (2011), we based our selection of the most adequate number of subgroups on several criteria. Specifically, we relied on the Akaike information criterion (AIC), modified AIC_3, Bayesian information criterion (BIC), and heuristic consistent AIC (CAIC) (Sarstedt and Ringle 2010). According to Sarstedt et al. (2011), the appropriate number of groups depends on a joint evaluation of CAIC and AIC_3. Our results indicated that a two-group solution was most appropriate (Table 5). In Table 5 we detail the

development of the FIMIX-PLS subgroup sizes. We did not investigate solutions with more than five subgroups, because the smallest subgroup size attains levels of less than 4%, too small to support group-specific PLS path analyses. These small subgroups also are relatively less important for interpretations from a managerial perspective. With our two-subgroup solution, each case evinces a probability of membership, according to the FIMIX-PLS algorithm, in either subgroup. Thus we derived a larger group with $\pi_1 = .51$ and a smaller one with $\pi_2 = .49$.

Table 5 here

Subsequently, we assigned each case to Subgroup 1 or Subgroup 2, according to its maximum probability of subgroup membership, and analyzed both subgroups by applying the standard PLS algorithm. We used several approaches to conduct the multigroup comparison; we report the results of the subgroup-specific PLS analysis and the significance of the differences between the two subgroups' paths in Table 6. Reconfiguring exerted a stronger impact on marketing ($\beta = .44$, $p < .01$) and technological ($\beta = .31$, $p < .01$) capabilities in Subgroup 1 than in Subgroup 2 ($\beta = .19$, $p < .10$; $\beta = .23$, $p < .10$, respectively). Significant differences also arose in the relationships of sensing with marketing and technological capabilities across subgroups: in Subgroup 1, sensing revealed positive relationships with both marketing ($\beta = .48$, $p < .01$) and technological ($\beta = .68$, $p < .01$) capabilities, whereas in Subgroup 2, it had significant negative relationships with marketing ($\beta = –.30$, $p < .01$) and technological ($\beta = –.33$, $p < .01$) capabilities. Furthermore, sensing revealed a stronger relationship with reconfiguring in Subgroup 1 ($\beta = .52$, $p < .01$) than in Subgroup 2 ($\beta = .37$, $p < .01$), even if they were not significantly different.[4]

[4] Although not the focus of this study, we found that technological capabilities related more positively to performance in stable competitive environments than in turbulent ones. This finding may sound counterintuitive, and previous research is inconclusive too. Song et al. (2005) argue that technological capabilities enable firms to respond to, leverage, and benefit from turbulence. However, knowledge embedded in technological capabilities may

Both the endogenous constructs, marketing and technological capabilities, showed an increase in their R^2 values, increasing by 22% (marketing capability) and 29% (technological capability) compared to the global model. Reconfiguring and firm performance indicated slightly improved R^2 values of 37% each. We calculated these values as the sum of the two constructs' R^2 values across the two groups, weighted by the relative subgroup size (Ringle et al. 2010). The two-subgroup solution based on FIMIX-PLS provided a better fit than the global model, especially for explaining marketing and technological capabilities.

Table 6 here

Finally, we sought to identify if any environmental turbulence facets explained differences between the two subgroups. We ran non-parametric Mann-Whitney U-tests (the data did not follow a normal distribution) on the latent scores of the three elements of environmental turbulence. We also tested other variables, including (1) credit ratings provided by Dun & Bradstreet, because cash flow could affect the extent to which reconfiguration specifications are manifest in concrete marketing and technological capabilities; (2) the degree to which the firm adopts a strategic service orientation, which could shift its emphasis on actual operating capabilities, in accordance with the service-dominant logic; and (3) sales and number of employees, because firm size might relate to inertia. The results imply that the subgroups can be separated meaningfully on the basis of competitor turbulence ($p < .01$) and technological

---

lead to inertia in turbulent environments (Lieberman and Montgomery 1988), rendering them inflexible. Turbulence thus might either improve or harm existing technological capabilities. An alternative explanation holds that stable environments reward exploitation. Technological capabilities often rest on established business processes, and firms are more likely to automate appropriate business processes in stable environments. Previous research investigates the moderating role of market and technological turbulence in the relationship between marketing and technological capabilities and performance (e.g., Song et al. 2005); however, no research has investigated the effect of competitive turbulence in these relationships. Thus, further research is needed to clarify the performance implications of technological capabilities in conditions of high environmental turbulence.

turbulence ($p < .10$). Subgroup 1 contained firms acting in environments with high technological and competitor turbulence; Subgroup 2 firms functioned in relatively stable environments. Market turbulence did not significantly explain differences between the two groups.

The results of a binary logistic regression model, including technological and competitor turbulence and their interaction, showed that our model, compared with a base model excluding the two constructs, was statistically significant ($p < .05$), and the resulting classification corresponded to 62.3% of the FIMIX-PLS classification. The Hosmer and Lemeshow test also affirmed our model. The Wald criterion indicated that only competitor turbulence contributed significantly to accurate FIMIX segment allocations ($p = .03$), whereas technological turbulence and the interaction term were not significant predictors.

In summary, the FIMIX-PLS procedure reliably identified two segments with distinctive inner model path estimates that differed significantly from the results for the full dataset. In contrast with the global model, sensing and reconfiguring showed stronger positive relationships with marketing and technological capabilities. The FIMIX-PLS analysis also achieved a considerably improved model fit, according to the higher R^2 values. In the course of an ex post analysis, competitor turbulence emerged as a suitable explanatory variable. The *a priori* segmentation, based on the latent variable score of competitor turbulence, followed by segment-specific path analyses, yielded findings comparable to those that emerged from the FIMIX-PLS procedure. Our results thus offer partial support for H4a, b and H5a, b; technological and market turbulence did not moderate the impact of dynamic capabilities on marketing and technological capabilities, but greater competitive turbulence amplified this impact, confirming H6a, b and H7 a, b.

Discussion

This study offers several contributions that improve managerial and theoretical understanding of marketing and technological capabilities, as well as how they depend on sensing and reconfiguring. First, we have integrated the dynamic capability view with strategic marketing capability research. Generally, without consideration of environmental turbulence, we find that dynamic capabilities, as manifested by sensing and reconfiguring processes, have a positive effect on marketing and technological capabilities, which in turn have significant positive effects on firm performance. Thus, this study confirms the prevalent argument regarding the importance of capacities for sensing and reconfiguring to improve marketing and technological capabilities. Second, our findings provide a more nuanced understanding of the effects of environmental turbulence on organizational capabilities. We support the emerging consensus that dynamic capabilities exist in all environments, irrespective of their degree of turbulence (e.g., Zahra et al. 2006). Firms confronting turbulent environments may benefit from the frequent use of dynamic capabilities, to ensure their marketing and technological capabilities remain competitive. They also can benefit in stable environments, albeit to a lesser extent.

Whereas prior research has focused on investigating the direct effects of environmental turbulence on dynamic capabilities and assessed its possible moderating effect, chiefly at an aggregate level, we find that the effects of sensing and reconfiguring (i.e., dynamic capabilities) on technological and marketing capabilities are positive, irrespective of the degree of market and technological turbulence, but they differ in their impact across stable versus turbulent competitive environments. The positive effects of sensing and reconfiguring on technological and marketing capabilities, and thus their value, are stronger for firms operating in competitively turbulent environments. Reconfiguring has a significantly stronger relationship with marketing

capabilities when firms face intense competition. The positive effects of sensing on marketing and technological capabilities in turbulent competitive environments even become negative when the firm faces little competition, though this result is less surprising when we consider that in stable environments, capability gaps grow smaller or even nonexistent. That is, when competition is stable, the opportunities and potential for capability improvements diminish, and engaging in frequent sensing is less relevant, so the benefits of improving already strong technological and marketing capabilities might not outweigh the related costs. Frequent sensing is not likely in such circumstances, which explains the negative association of frequent sensing with marketing and technological capabilities in stable competitive environments.

By empirically testing our hypotheses, this study also adds to research on marketing and technological capabilities, as well as dynamic capabilities. Because of the difficulties associated with measuring dynamic capabilities and their effects (Easterby-Smith et al. 2009; Kraatz and Zajac 2001), most research into dynamic capabilities has remained largely theoretical or based on case studies; the empirical research that has been published often deals with the evolution of dynamic capabilities (e.g., Narayanan et al. 2009; Zhou and Li 2010) or offers case study insights (e.g., Danneels 2010). Little empirical research has examined the association of dynamic capabilities with marketing and technological capabilities (e.g., Vorhies et al. 2011), as we do.

Finally, we contribute to an understanding of how firms compete through their marketing and technological capabilities, in that we examine, both conceptually and empirically, the association between dynamic capabilities and marketing and technological capabilities. In so doing, we confirm arguments that dynamic capabilities are valuable in their effects on operational capabilities. Furthermore, we clarify that the extent of these effects may be conditional on competitive turbulence, which creates opportunities to reconfigure marketing

capabilities, technological capabilities, or both (though such capability improvement potentials diminish in fairly stable environments). Those opportunities in turn trigger frequent engagement in dynamic capabilities. We also show that the actual uptake in concrete marketing and technological capabilities may depend on not only producing reconfiguration specifications (i.e., frequent use of dynamic capabilities) but also the pressure exerted by competitive turbulence and attention paid to such, which prompts a firm's resource allocation to fill a certain capability gap.

Specifically, this study identifies three avenues through which environmental turbulence affects a firm's operating capabilities; in doing so, it contributes to the dynamic capabilities view and moves beyond the understanding that turbulence generates capability gaps. That is, the deployment of dynamic capabilities produces reconfiguration specifications that outline how to close a capability gap. We also explain that concrete capability configurations are subject to goal-induced attention that can vary for market, technological, and competitor turbulence. This three-stage conceptualization of the impact of environmental turbulence on operational capabilities aligns with Miller and Chen's (1994) view of organizational change as an outcome jointly determined by the (1) opportunity to change, which represents the actual capability gap; (2) capacity to change, which embodies the frequent deployment of dynamic capabilities; and (3) motivation to change, as reflected in our conceptualization of attention paid to a capability gap.

Managerial implications

Our findings also have interesting practical implications. Managers who seek to align their firms' marketing and technological capabilities with a changing market environment should understand that the careful management of dynamic capabilities (i.e., sensing and reconfiguring) to address environmental conditions is essential for achieving capability alignment and ultimately

improving performance. Sensing enables firms to scan and explore technologies and markets; reconfiguring enables them to reconfigure their resources, capabilities, structures, and processes.

Although matching internal capabilities with external conditions is an established tenant of contingency theory, our results highlight that managers need to carefully consider the specific *source* of turbulence affecting their firm, because sensing and reconfiguring processes improve and align marketing and technological capabilities with environmental turbulence differently, depending on the source of turbulence. Managers can enhance firm performance by using dynamic capabilities, regardless of the degree of market and technological turbulence they face. However, sensing and reconfiguring processes are especially valuable to managers in intensely competitive markets. Also, frequent sensing may have negative effects in stable competitive markets. Specifically, the frequent dynamic capability use can reduce the efficiency of marketing and technological capabilities, such that the costs outweigh the benefits in stable settings.

Our study further demonstrates that the impact of a firm's utilization of sensing and reconfiguring processes is mediated by its marketing and technological capabilities. Devoting resources to developing and utilizing sensing and reconfiguring capacities does not inherently lead to superior performance. However, dynamic capabilities help managers keep the firm's operational capabilities aligned with external conditions, which in turn improves performance.

In addition, managers should note that marketing and technological capabilities differ in their impact on performance, according to the competitive situation the firm faces. We did not offer hypotheses about these relationships, but our findings indicate that marketing capabilities contribute most to firm performance in highly competitive environments, whereas technological capabilities have stronger performance impacts in competitively stable environments. We reason that competitively stable environments might reward the exploitation of existing technological

capabilities, which often entail automated or well-established business processes. Firms also are more likely to automate suitable business processes in stable environments.

Limitations and directions for further research

Our data are cross-sectional and represent only large firms, so caution should be exercised when drawing cause-and-effect inferences from them. The results also should not be interpreted as clear evidence of causal relationships; rather, they support an existing causal scheme. Further research could conduct industry-specific analyses to establish the underlying relationships more firmly. Considering the nature of these relationships, we also suggest that more insights could result from investigations of changes in marketing and technological capabilities, caused by market sensing and reconfiguring capabilities over time. Also, research using longitudinal data should investigate the self-reinforcing nature of the dynamic capabilities underlying the frequency of dynamic capability deployment. Furthermore, though we invested considerable effort in our construct validation and data collection, to ensure the quality of our self-reported survey data, the potential for unidentified biases remains.

Variables collected from the same source, using the same method, also may suffer some bias (cf. Spector 2006), and our sample was relatively small. Although PLS can deal with small sample sizes (Henseler et al. 2009), further research should replicate our findings with a complementary, possibly larger sample. Finally, subgroup analyses that compare subgroup-specific path estimates might establish measurement invariance across subgroups (Vandenberg and Lance 2000), but no such method exists for PLS modeling yet.

We determined that competitor turbulence explained a significant proportion of the heterogeneity uncovered in the FIMIX-PLS analysis. Despite the encouraging results of the ex

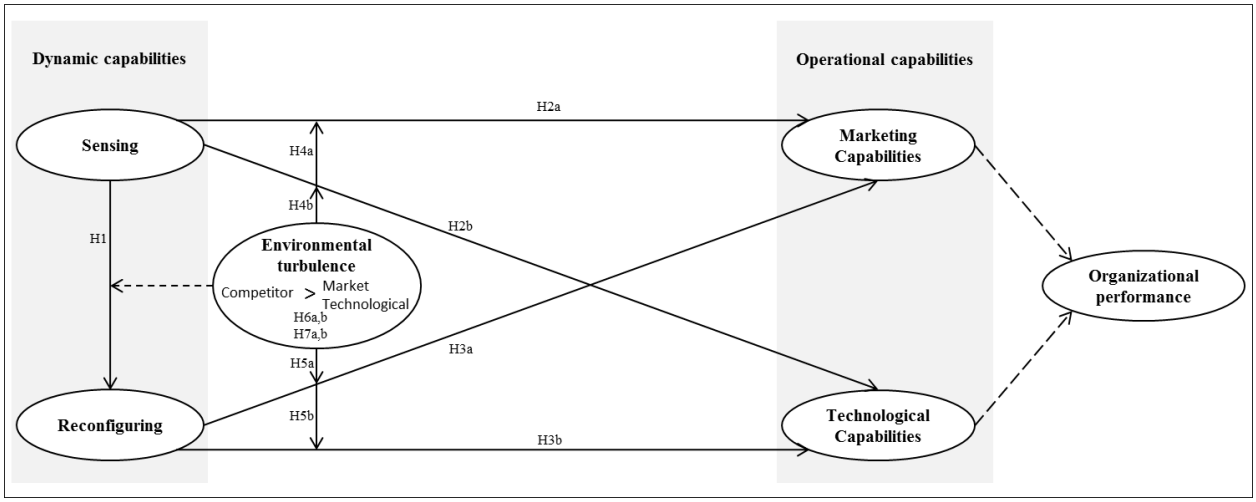
post analysis, our conclusions are subject to the covariates available in our dataset. Additional research therefore should substantiate the relevance of competitor turbulence in the dynamic capability framework and assess other potential moderators of the relationships between dynamic capabilities and marketing and technological capabilities, if any. Finally, more detailed analyses of sensing and reconfiguring processes might specify the stage at which the additional generation of technological and marketing knowledge and the resulting reconfigurations of the resource base become counterproductive, with negative effects on marketing and technological capabilities. Related studies could determine if deep but infrequent sensing and reconfiguring activities are more or less beneficial than shallow but frequent ones for firms with limited resources. Further research may also examine in more detail the context in which sensing processes are deployed—for example, whether differences exist between organizations that focus their sensing processes on current markets compared with underserved or new markets.

Acknowledgments

We would like to thank the four anonymous reviewers as well as the editor for their constructive comments. We particularly acknowledge Ian Lings, Christine Eckert, and Christian Ringle for their valuable and constructive comments on earlier drafts of this paper. We would also like to acknowledge the support of the Australian Research Council (LP0882944).

Figure 1:

Conceptual model



→ hypothesized relationships; ----> non-hypothesized relationships

Table 1:

Selected empirical research on dynamic capabilities and marketing and technological capabilities

Focus	Study	Main findings
Dynamic capability development/ evolution	Verona and Ravasi (2003)	Dynamic capabilities comprise knowledge creation and absorption, knowledge integration, and knowledge reconfiguration.
	Arthurs and Busenitz (2006)	Venture capital-backed ventures demonstrate greater dynamic capabilities related to product and management development but not to legal and government regulation threats.
	Danneels (2008)	Five antecedents of dynamic capabilities have varying effects: willingness to cannibalize, constructive conflict, scanning (i.e., sensing), and slack have contemporaneous effects; scanning also has a lagged effect, and slack has a lagged effect on dynamic capabilities.
	Zhou and Li (2009)	Strategic orientation is an important driver of dynamic capability; scanning drives the contingency effects of strategic orientation and market dynamics.
Effect of dynamic capabilities on performance	Jantunen et al. (2005)	Entrepreneurial orientation and reconfiguring activities have positive effects on performance.
	Menguc and Auh (2006)	The effect of market orientation on firm performance is stronger when market orientation is bundled with internal complementary resources, such as innovativeness. The interaction is conceptualized as a dynamic capability.
	Yalcinkaya et al. (2007)	Exploration capability has a positive, significant influence on market performance and degree of product innovation. Exploitation capability negatively influences the degree of product innovation and has no significant impact on market performance.
	Wu (2010)	Firms that possess dynamic capabilities can effectively enhance their competitive advantages, despite facing highly volatile environments.
	Protogerou et al. (2012)	Dynamic capabilities influence operational capabilities, which have significant effects on performance.
	Drnevich and Kriauciunas (2011)	Environmental dynamism negatively affects the contribution of ordinary capabilities and positively affects the contribution of dynamic capabilities to relative firm performance.
	Wilden et al. (2013)	Competitive intensity and firm structure enable the positive effects of dynamic capabilities on firm performance (i.e., sales growth and firm survival).
Effect of marketing & technological capabilities on performance	Vorhies et al. (1999)	Market-driven business units develop higher levels of vital marketing capabilities (market research, pricing, product development, channels, promotion, and market management) than less market-driven firms and significantly outperform these rivals in terms of organizational performance.
	Hooley et al. (2005)	Marketing resources affect financial performance indirectly, by creating customer satisfaction and loyalty and superior market performance.
	Song et al. (2005)	The effect of technological capabilities is independent of the degree of technological turbulence; marketing capabilities have a stronger effect in stable environments. Their complementary effect is significant only in high turbulence environments.
	Galbreath and Galvin (2008)	Resources and capabilities are more important than industry structure. In service firms, resources are more important for explaining performance variation than in manufacturing firms. In both manufacturing and services firms, intangible assets and capabilities explain performance variation, but tangible resources do not.
	Ruiz-Ortega and García-Villaverde (2008)	In the interactions of technological capabilities, marketing capabilities, and entry strategies, different combinations have varying effects on firm performance.
	Chen et al. (2009)	Organizations with different resource combinations follow different growth strategies. Technological capability moderates the relationship between growth strategies and new venture performance.
	Morgan et al. (2009)	Marketing capabilities have direct, complementary effects on both revenue and margin growth rates. Brand management and customer relationship management capabilities have opposing effects on revenue and margin growth rates.
	Ramaswami et al. (2009)	Market-based capabilities have significant influences on selected business processes, which positively affect financial performance.
Relationship dynamic capabilities & technological and marketing capabilities	Vorhies et al. (2011)	Improving brand management and customer relationship management affects financial performance. Firms cannot engage in both exploration and exploitation at high levels without risking a negative impact on customer-focused marketing capabilities.

Table 2:

Reflective measurements

Construct	Indicators	Mean	SD	Loadings	AVE	CR	α
[a] Sensing	In my organization….				.50	.83	.76
	people participate in professional association activities.	4.97	1.46	.74***			
	employees attend scientific or professional conferences	4.49	1.75	.67***			
	we connect with our active network of contacts with the scientific and research community.	3.88	1.83	.62***			
	we use established processes to identify target market segments, changing customer needs and customer innovation.	4.82	1.44	.74***			
	we observe best practices in our sector.	5.52	1.18	.74***			
[a] Reconfiguring	How often have you carried out the following activities between 2004 and 2008?				.61	.92	.89
	Implementation of a new or substantially changed company strategy	4.58	1.42	.83***			
	Implementation of new kinds of management methods	4.49	1.36	.84***			
	New or substantially changed marketing method or strategy	4.52	1.45	.76***			
	New or substantially changed technological equipment, manufacturing or service delivery process	4.55	1.43	.64***			
	Substantial renewal of business processes	4.53	1.44	.81***			
	Initiation of new procedures or systems	5.06	1.28	.76***			
	New or substantially changed ways of achieving our targets and objectives	4.66	1.31	.83***			
[b] Marketing Capability	Please indicate your firm's capabilities relative to competition for each of the following. Please indicate if your capabilities have become weaker or stronger within the last three years.				.64	.88	.81
	Market knowledge	3.05	.98	.80***			
	Control and access to distribution channels	2.49	.98	.75***			
	Advantageous relationships with customers	3.05	1.05	.80***			
	Established customer base	3.12	.94	.84***			
[b] Technological Capability	Please indicate your firm's capabilities relative to competition for each of the following. Please indicate if your capabilities have become weaker or stronger within the last three years.				.64	.84	.72
	Efficient and effective production department	2.59	.98	.82***			
	Economies of scales and technical expertise	2.81	1.07	.84***			
	Technological capabilities and equipment	2.75	.43	.74***			
[c] Firm Performance	Please indicate your organization's performance relative to that of the competition over the last three years for each of the following.				.67	.94	.92
	Sales volume	3.63	.90	.85***			
	Growth in sales volume	3.63	.92	.85***			
	Market share	3.70	.92	.78***			
	Growth in market share	3.67	.94	.84***			
	Profit margin	3.59	1.04	.82***			
	Return on own capital	3.47	1.06	.80***			
	Net profits	3.52	1.07	.80***			

**** Significant at .001 (two-tailed). *** Significant at .01 (two-tailed). ** Significant at .05 (two-tailed). *Significant at .10 (two-tailed).

[a] Anchored at 1 = rarely and 7 = very often.

[b] Anchored at 1 = much weaker than competitors and 5 = much stronger than competitors; and at –2 = much weaker and 2 = much stronger.

[c] Anchored at 1 = strongly disagree and 7 =strongly agree.

Table 3:

Formative measurements

Construct	Indicators	Item	VIF	Weights
[a] Environmental Turbulence	In general, how much do you disagree or agree with each of the following statements characterizing the business environment or conditions in your primary markets?			
Technological Turbulence	The technology in our industry is changing rapidly.	TT1	2.48	.72**
	It is very difficult to forecast where the technology in our industry will be in the next two to three years.	TT2	1.04	.20
	A large number of new product ideas have been made possible through technological breakthroughs in our industry.	TT3	1.74	.71**
	The technological changes in this industry are frequent.	TT4	3.12	-.48
Market Turbulence	In our kind of business, customers' product preferences change quite a bit over time.	MT1	1.06	.32*
	We are witnessing demand for our products and services from customers who have never bought them before.	MT2	1.05	.78****
	We cater to many of the same customers that we used to in the past.	MT3	1.00	-.43**
	It is very difficult to predict any changes in this marketplace.	MT4	1.01	-.18
Competitor Turbulence	Competition in our industry is cutthroat.	CT1	2.13	-.48
	There are many 'promotion wars' in our industry.	CT2	1.77	.88****
	Price competition is a hallmark of our industry.	CT3	1.65	.74***
	One hears of a new competitive move almost every day.	CT4	1.20	-.25

**** Significant at .001 (two-tailed). *** Significant at .01 (two-tailed). ** Significant at .05 (two-tailed). *Significant at .10 (two-tailed).

[a] Anchored at 1 = strongly disagree and 7 = strongly agree.

Table 4:

Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Age	n.a.												
(2) Competitor turbulence	-0.11*	n.a.											
(3) Market turbulence	-0.10	0.49****	n.a.										
(4) Employee number	0.02	0.03	0.02	n.a.									
(5) Industry_manu	-0.14**	0.01	-0.02	-0.08	n.a.								
(6) Industry_service	-0.07	0.05	0.01	0.00	0.34****	n.a.							
(7) Marketing capability	-0.08	0.14**	0.21***	0.00	0.09	0.11	0.80						
(8) Firm performance	-0.07	0.17**	0.24****	0.06	0.03	0.04	0.47****	0.82					
(9) Reconfiguring	-0.15**	0.13*	0.20***	0.10	0.07	0.03	0.41****	0.34****	0.78				
(10) Sales	-0.09	0.09	0.06	0.65****	-0.11*	0.00	0.05	0.14**	0.02	n.a.			
(11) Sensing	-0.03	0.09	0.11	0.14	-0.02	-0.02	0.31****	0.32****	0.43****	0.17*	0.71		
(12) Technological turbulence	-0.08	0.31****	0.37****	-0.02	-0.04	0.03	0.18***	0.10	0.14**	-0.02	0.12*	n.a.	
(13) Technological capability	-0.03	0.13**	0.18	0.13**	0.02	0.16**	0.60****	0.52****	0.40****	0.11	0.36****	0.14**	0.80

**** Significant at .001 (two-tailed). *** Significant at .01 (two-tailed). ** Significant at .05 (two-tailed). *Significant at .10 (two-tailed).

Notes: The square root of the AVE is shown on the diagonal for the reflective constructs.

Table 5:

FIMIX-PLS evaluation criteria and relative group sizes

S	Akaike information criterion (AIC)	Modified AIC_3	Bayesian information criterion (BIC)	Consistent AIC (CAIC)	Relative segment sizes π_G				
					g=1	g=2	g=3	g=4	g=5
s=2	2555.23	2578.23	2634.11	2634.21	.51	.49			
s=3	2594.30	2593.30	2714.33	2714.49	.53	.26	.20		
s=4	2634.92	2609.92	2796.10	2796.31	.45	.24	.23	.09	
s=5	2615.29	2566.29	2817.62	2817.88	.40	.22	.22	.13	.04

Table 6:

Global model and FIMIX-PLS results of two latent groups

		FIMIX					
	Global	S1 high competitor turbulence (n = 126)	S2 low competitor turbulence (n = 102)	Path Coefficients-diff (S1 – S2)	Diff. Henseler	Diff. Chin	Diff. Permutation
Reconfiguring → Marketing capability	.33***	.44***	.19*	.25	sig.**	sig.**	sig.**
Reconfiguring → Technological capability	.30***	.31***	.23*	.08	n. sig.	n. sig.	n. sig.
Sensing → Marketing capability	.16**	.48***	-.30***	.78	sig.*	sig.*	sig.*
Sensing → Technological capability	.22***	.68***	-.33***	1.05	sig.*	sig.*	sig.*
Sensing → Reconfiguring	.44***	.52***	.37***	.15	sig.***	n. sig.	n. sig.
Marketing capability → Performance	.24***	.53***	.07				
Technological capability → Performance	.39***	.13	.50***				
Age → Performance	-.02	.08	-.10				
Sales → Performance	.13*	.18**	.06				
Employee → Performance	-.09	-.11	-.02				
Industry_service → Performance	-.05	-.11*	.03				
Industry_manu → Performance	.02	.04	-.10				
R^2 (Marketing Capability)	.18	.40					
R^2 (Technological Capability)	.19	.48					
R^2 (Performance)	.33	.37					
R^2 (Reconfiguring)	.20	.37					

*** $p < .01$. ** $p < .05$. *$p < .10$.
Notes: Diff. = Significance of the path difference for the multigroup comparison.

References

ABS (2004). *Counts of Businesses*. Canberra: Australian Bureau of Statistics.

Afuah, A. (2002). Mapping technological capabilities into product markets and competitive advantage: The case of cholesterol drugs. *Strategic Management Journal, 23*, 171-179.

Arthurs, J. D., & Busenitz, L. W. (2006). Dynamic Capabilities and Venture performance: The effects of Venture Capitalists. *Journal of Business Venturing, 21*, 195-215.

Auh, S., & Menguc, B. (2005). Balancing exploration and exploitation: The moderating role of competitive intensity. *Journal of Business Research, 58*, 1652-1661.

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management, 17*, 99-120.

Baum, J. R., & Wally, S. (2003). Strategic Decision Speed and Firm Performance. *Strategic Management Journal, 24*, 1107-1129.

Bollen, K., & Lennox, R. (1991). Conventional Wisdom on Measurement: A Structural Equation Perspective. *Psychological Bulletin, 110*, 305-314.

Bontis, N., Booker, L. D., & Serenko, A. (2007). The mediating effect of organizational reputation on customer loyalty and service recommendation in the banking industry. *Management Decision, 45*, 1426-1445.

Calantone, R., Garcia, R., & Dröge, C. (2003). The effects of environmental turbulence on new product development strategy planning. *Journal of Product Innovation Management, 20*, 90-103.

Chakravarthy, B. (1986). Measuring Strategic Performance. *Strategic Management Journal, 7*, 437-458.

Chandy, R. K., & Tellis, G. J. (2000). The Incumbent's Curse? Incumbency, Size, and Radical Product Innovation. *Journal of Marketing, 64*, 1-17.

Chen, M.-J., Farh, J.-L., & MacMillan, I. C. (1993). An exploration of the expertness of outside informants. *Academy of Management Journal, 36*, 1614-1632.

Chen, M. J., Smith, K. G., & Grimm, C. M. (1992). Action characteristics as predictors of competitive responses. *Management Science, 38*, 439-455.

Chen, X., Zou, H., & Wang, D. T. (2009). How do new ventures grow? Firm capabilities, growth strategies and performance. *International Journal of Research in Marketing, 26*, 294-303.

Chin, W. (1998). The Partial Least Squares Approach to Structural Equation Modeling. In G. Marcoulides (Ed.), *Modern Methods for Business Research* (pp. 295-336): Lawrence Erlbaum Associates Inc.

Chmielewski, D. A., & Paladino, A. (2007). Driving a Resource Orientation: Reviewing the Role of Resource and Capability Characteristics. *Management Decision, 45*, 462-483.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale: Lawrence Erlbaum Associates, Inc.

Cohen, W., & Levinthal, D. (1990). Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly, 35*, 128-152.

Collis, D. J. (1994). Research note: How valuable are organizational capabilities? *Strategic Management Journal, 15*, 143-152.

Cycyota, C. S., & Harrison, D. A. (2006). What (Not) to Expect When Surveying Executives: A Meta-Analysis of Top Manager Response Rates and Techniques Over Time. *Organizational Research Methods, 9*, 133-160.

Cyert, R. M., & March, J. (1963). *A Behavioral Theory of the Firm*. Englewood Cliffs, NJ: Prentice Hall.

D'Aveni, R. A. (1994). *Hypercompetition*. New York: The Free Press.
Daft, R. L., Sormunen, J., & Parks, D. (1988). Chief Executive Scanning, Environmental Characteristics, and Company Performance: An Empirical Study. *Strategic Management Journal, 9*, 123-139.
Danneels, E. (2007). The process of technological competence leveraging. *Strategic Management Journal, 28*, 511-533.
Danneels, E. (2008). Organizational Antecedents of Second-order Competences. *Strategic Management Journal, 29*, 519-543.
Danneels, E. (2010). Trying to become a different type of company: dynamic capability at Smith Corona. *Strategic Management Journal, 32*, 1-31.
Day, G. S. (1994). The capabilities of market-driven organizations. *Journal of Marketing, 58*, 37-52.
Day, G. S. (2011). Closing the Marketing Capabilities Gap. *Journal of Marketing, 75*, 183–195.
Dayan, M., & Di Benedetto, C. A. (2010). The impact of structural and contextual factors on trust formation in product development teams. *Industrial Marketing Management, 39*, 691-703.
DeSarbo, W., S., Di Benedetto, C. A., Song, M., & Sinha, I. (2005). Revisiting the Miles and Snow strategic framework: uncovering interrelationships between strategic types, capabilities, environmental uncertainty, and firm performance. *Strategic Management Journal, 26*, 47-74.
Dess, G., & Robinson Jr, R. (1984). Measuring Organizational Performance in the Absence of Objective Measures: The Case of the Privately-held Firm and Conglomerate Business Unit. *Strategic Management Journal, 5*, 265-273.
DeVellis, R. (2003). *Scale development: theory and applications*. Thousand Oaks: Sage.
Diamantopoulos, A., & Winklhofer, H. M. (2001). Index construction with formative indicators: An alternative to scale development. *Journal of Marketing Research, 38*, 269-277.
Drnevich, P. L., & Kriauciunas, A. P. (2011). Clarifying the conditions and limits of the contributions of ordinary and dynamic capabilities to relative firm performance. *Strategic Management Journal, 32*, 254-279.
Droge, C., Calantone, R., & Harmancioglu, N. (2008). New Product Success: Is It Really Controllable by Managers in Highly Turbulent Environments? *Journal of Product Innovation Management, 25*, 272-286.
Duncan , R. B. (1972). Characteristics of organizational environments and perceived environmental uncertainty. *Administrative Science Quarterly, 17*, 313-327.
Easterby-Smith, M., Lyles, M. A., & Peteraf, M. A. (2009). Dynamic Capabilities: Current Debates and Future Directions. *British Journal of Management, 20*, S1-S8.
Eisenhardt, K., & Martin, J. (2000). Dynamic capabilities: What are they? *Strategic Management Journal, 21*, 1105-1121.
Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*, 1149-1160.
Ferrier, W. J., Smith, K. G., & Grimm, C. (1999). The Role of Competitive Action in Market Share Erosion and Industry Dethronement: A Study of Industry Leaders and Challengers. *Academy of Management Journal, 42*, 372-388.
Fornell, C., & Bookstein, F., L. (1982). Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. *Journal of Marketing Research, 19*, 440-452.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*, 39-50.

Galbreath, J., & Galvin, P. (2008). Firm Factors, Industry Structure and Performance Variation: New Empirical Evidence to a Classic Debate. *Journal of Business Research, 61*, 109-117.

Garg, V., K., Walters, B., A., & Priem, R., L. (2003). Chief executive scanning emphases, environmental dynamism, and manufacturing firm performance. *Strategic Management Journal, 24*, 725-744.

Gefen, D., Straub, D., & Boudreau, M. (2000). Structural Equation Modelling and Regression: Guidelines for Research Practice. *Communications of the Association for Information Systems, 4*, 1-79.

George, G. (2005). Learning to be Capable: Patenting and Licensing at the Wisconsin Alumni Research Foundation 1925-2002. *Industrial and Corporate Change, 14*, 119-151.

Glazer, R., & Weiss, A. M. (1993). Marketing in turbulent environments: decision processes and the time-sensitivity of information. *Journal of Marketing Research, 30*, 509-521.

Greve, H. R. (1998). Performance, aspirations, and risky organizational change. *Administrative Science Quarterly, 43*, 58-86.

Greve, H. R. (2002). Performance, aspirations, and risky organizational change. *Administrative Science Quarterly, 43*, 58-86.

Greve, H. R. (2008). A behavioral theory of firm growth: Sequential attention to size and performance goals. *Academy of Management Journal, 51*, 476-494.

Hahn, C., Johnson, M., Herrmann, A., & Huber, F. (2002). Capturing Customer Heterogeneity Using a Finite Mixture Approach. *Schmalenbach Business Review, 54*, 243-269.

Hair, J., Sarstedt, M., Ringle, C., & Mena, J. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science, 40*, 414-433.

Hair, J. E., Black, W. C., Babin, B., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate Data Analysis*. Upper Saddle River: Prentice Hall.

Hair, J. F., Ringle, C., & Sarstedt, M. (2011). PLS-SEM: Indeed a Silver Bullet. *Journal of Marketing Theory and Practice, 19*, 139–151.

Hair Jr, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial Least Squares Structural Equation Modeling: Rigorous Applications, Better Results and Higher Acceptance. *Long Range Planning, 46*, 1-12.

Haleblian, J., Kim, J. Y., & Rajagopalan, N. (2006). The influence of acquisition experience and performance on acquisition behavior: Evidence from the U.S. commercial banking industry. *Academy of Management Journal, 49*, 357–370.

Hanvanich, S., Sivakumar, K., & Hult, G. T. M. (2006). The relationship of learning and memory with organizational performance: the moderating role of turbulence. *Journal of the Academy of Marketing Science, 34*, 600-612.

Helfat, C., Finkelstein, S., Mitchell, W., Peteraf, M., Singh, H., Teece, D., et al. (2007). *Dynamic Capabilities: Understanding Strategic Change in Organisations*. Malden: Blackwell Publishing.

Heneman, H. G. I. (1974). Comparisons of Self and Superior Ratings. *Journal of Applied Psychology, 59*, 638-642.

Henri, J.-F. (2006). Organizational Culture and Performance Measurement Systems. *Accounting, Organizations and Society, 31*, 77-103.

Henseler, J., Ringle, C., & Sinkovics, R. (2009). The Use of Partial Least Squares Path Modeling in International Marketing. *Advances in International Marketing, 20*, 277-320.

Hooley, G. J., Greenley, G. E., Cadogan, J. W., & Fahy, J. (2005). The performance impact of marketing resources. *Journal of Business Research, 58*, 18-27.

Jantunen, A., Puumalainen, K., Saarenketo, S., & Kyläheiko, K. (2005). Entrepreneurial Orientation, Dynamic Capabilities and International Performance. *Journal of International Entrepreneurship, 3*, 223-243.

Jarvis, C. B., MacKenzie, S. B., & Podsakoff, P. M. (2003). A critical review of construct indicators and measurement model misspecification in marketing and consumer research. *Journal of consumer research, 30*, 199-218.

Jaworski, B. J., & Kohli, A. K. (1993). Market Orientation: Antecedents and Consequences. *Journal of Marketing, 57*, 53-70.

Kohli, A. K., & Jaworski, B. J. (1990). Market Orientation: The Construct, Research Propositions, and Managerial Implications. *Journal of Marketing, 54*, 1-18.

Kraatz, M., & Zajac, E. (2001). How organizational resources affect strategic change and performance in turbulent environments: Theory and evidence. *Organization Science, 12*, 632-657.

Kumar, N., Stern, L. W., & Anderson, J. C. (1993). Conducting interorganizational research using key informants. *Academy of Management Journal, 36*, 1633-1651.

Lane, P. J., Salk, J. E., & Lyles, M. A. (2001). Absorptive Capacity, Learning, and Performance in International Joint Ventures *Strategic Management Journal, 22*, 1139-1161.

Lant, T. K., Milliken, F. J., & Batra, B. (1992). The role of managerial learning and interpretation in strategic persistence and reorientation: An empirical exploration. *Strategic Management Journal, 13*, 585–608.

Lavie, D. (2006). Capability reconfiguration: An analysis of incumbent responses to technological change. *Academy of Management Review, 31*, 153-174.

Leonard-Barton, D. (1992). Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development. *Strategic Management Journal, 13*, 111-125.

Levinthal, D. (1991). Organizational adaptation and environmental selection-interrelated processes of change. *Organization Science, 2*, 140-145.

Lew, Y. K., & Sinkovics, R. R. (2013). Crossing Borders and Industry Sectors: Behavioral Governance in Strategic Alliances and Product Innovation for Competitive Advantage. *Long Range Planning, 46*, 13-38.

Li, T., & Calantone, R. J. (1998). The impact of market knowledge competence on new product advantage: conceptualization and empirical examination. *Journal of Marketing*, 13-29.

Lieberman, M. B., & Montgomery, D. B. (1988). First-Mover Advantages. *Strategic Management Journal, 9*, 41-58.

Makadok, R. (2001). Toward a synthesis of the resource-based and dynamic-capability views of rent creation. *Strategic Management Journal, 22*, 387-401.

March, J. G., & Shapira, Z. (1992). Variable risk preferences and the focus of attention. *Psychological Review, 99*, 172-183.

Menguc, B., & Auh, S. (2006). Creating a Firm-Level Dynamic Capability through Capitalizing on Market Orientation and Innovativeness. *Journal of the Academy of Marketing Science., 34*, 63-73.

Miller, D. (1987). Strategy Making and Structure: Analysis and Implications for Performance. *Academy of Management Journal, 30*, 7-32.

Miller, D., & Chen, M.-J. (1994). Sources and consequences of competitive inertia. *Administrative Science Quarterly, 39*, 1-17.

Moorman, C., & Miner, A. S. (1997). The Impact of Organizational Memory on New Product Performance and Creativity. *Journal of Marketing Research, 34*, 91-106.

Morgan, N. A. (2012). Marketing and Business Performance. *Journal of the Academy of Marketing Science, 40*, 102-119.

Morgan, N. A., Anderson, E. W., & Mittal, V. (2005). Understanding firms' customer satisfaction information usage. *Journal of Marketing, 69*, 131-151.

Morgan, N. A., Slotegraaf, R. J., & Vorhies, D. W. (2009). Linking marketing capabilities with profit growth. *International Journal of Research in Marketing, 26*, 284-293.

Nadkarni, S., & Barr, P. (2008). Environmental Context, Managerial Cognition, and Strategic Action: An Integrated View. *Strategic Management Journal, 29*, 1395-1428.

Nagarajan, A., & Mitchell, W. (1998). Evolutionary diffusion: Internal and external methods used to acquire encompassing, complementary, and incremental technological changes in the lithotripsy industry. *Strategic Management Journal, 19*, 1063-1077.

Narasimhan, O., Rajiv, S., & Dutta, S. (2006). Absorptive Capacity in High-Technology Markets: The Competitive Advantage of the Haves. *Marketing Science, 25*, 510-524.

Narayanan, V. K., Colwell, K., & Douglas, F. L. (2009). Building Organizational and Scientific Platforms in the Pharmaceutical Industry: A Process Perspective on the Development of Dynamic Capabilities. *British Journal of Management, 20*, S25-S40.

Narver, J. C., & Slater, S. F. (1990). The Effect of a Market Orientation on Business Profitability. *Journal of Marketing, 54*, 20-35.

Nevitt, J., & Hancock, G. R. (2001). Performance of Bootstrapping Approaches to Model Test Statistics and Parameter Standard Error Estimation in Structural Equation Modeling. *Structural Equation Modeling, 8*, 353-377.

Nunnally, J. C. (1978). *Psychometric theory* (2 ed.). New York: McGraw-Hill.

Penrose, E. (1959). *The Theory of the Growth of the Firm*. New York: John Wiley & Sons.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies. *Journal of Applied Psychology, 88*, 879-903.

Powell, T. C. (1992). Organizational Alignment as Competitive Advantage. *Strategic Management Journal, 13*, 119-134.

Prasnikar, J., Lisjak, M., Buhovac, A. R., & Stembergar, M. (2008). Identifying and Exploiting the Inter relationships between Technological and Marketing Capabilities. *Long Range Planning, 41*, 530-554.

Protogerou, A., Caloghirou, Y., & Lioukas, S. (2012). Dynamic capabilities and their indirect impact on firm performance. *Industrial and Corporate Change, 21*, 615-647.

Ramaswami, S., Srivastava, R., & Bhargava, M. (2009). Market-based capabilities and financial performance of firms: insights into marketing's contribution to firm value. *Journal of the Academy of Marketing Science, 37*, 97-116.

Reinartz, W., Haenlein, M., & Henseler, J. (2009). An empirical comparison of the efficacy of covariance-based and variance-based SEM. *International Journal of Research in Marketing, 26*, 332-344.

Rigdon, E., Ringle, C., & Sarstedt, M. (2010). Structural Modeling of Heterogeneous Data with Partial Least Squares. In N. K. Malhotra (Ed.), *Review of Marketing Research* (Vol. 7, pp. 255-296). Armonk: Sharpe.

Ringle, C., Sarstedt, M., & Mooi, E. (2010). Response-Based Segmentation Using Finite Mixture Partial Least Squares: Theoretical Foundations and an Application to American Customer Satisfaction Index Data. *Annals of Information Systems, 8*, 19-49.

Ringle, C., Sarstedt, M., & Straub, D. W. (2012). A Critical Look at the Use of PLS-SEM in MIS Quarterly. [Article]. *MIS Quarterly, 36*, iiv-8.

Ringle, C., Wende, S., & Will, A. (2005a). Customer Segmentation with FIMIX-PLS. In T. Aluja, J. Casanovas, V. Esposito Vinzi, A. Morineau & M. Tenenhaus (Eds.), *PLS and Related Methods: Proceedings of the PLS'05 International Symposium* (pp. 507-514). Paris: Decisia.

Ringle, C., Wende, S., & Will, A. (2005b). SmartPLS 2.0 (M3) Beta.

Ruiz-Ortega, M. J., & García-Villaverde, P. M. (2008). Capabilities and Competitive Tactics Influences on Performance: Implications of the Moment of Entry. *Journal of Business Research, 61*, 332-345.

Sarkar, M. B., Echambadi, R., & Harrison, J. S. (2001). Alliance entrepreneurship and firm market performance. *Strategic Management Journal, 22*, 701-711.

Sarstedt, M. (2008). A Review of Recent Approaches for Capturing Heterogeneity in Partial Least Squares Path Modelling. *Journal of Modelling in Management, 3*, 140-161.

Sarstedt, M., Becker, J.-M., & Ringle, C. (2011). Uncovering and Treating Unobserved Heterogeneity with FIMIX-PLS: Which Model Selection Criterion Provides an Appropriate Number of Segments? *Schmalenbach Business Review, 63*, 34-62.

Sarstedt, M., & Ringle, C. (2010). Treating Unobserved Heterogeneity in PLS Path Modelling: A Comparison of FIMIX-PLS with Different Data Analysis Strategies. *Journal of Applied Statistics, 37*, 1299-1378.

Sattler, H., Völckner, F., Riediger, C., & Ringle, C. (2010). The impact of brand extension success drivers on brand extension price premiums. *International Journal of Research in Marketing, 27*, 319-328.

Schilke, O. (2014). On the contingent value of dynamic capabilities for competitive advantage: The nonlinear moderating effect of environmental dynamism. *Strategic Management Journal, 35*, 179–203.

Sirmon, D. G., Hitt, M. A., Arregle, J.-L., & Campbell, J. T. (2010). The dynamic interplay of capability strengths and weaknesses: investigating the bases of temporary competitive advantage. *Strategic Management Journal, 31*, 1386-1409.

Slater, S. F., & Narver, J. C. (2000). Intelligence generation and superior customer value. *Journal of the Academy of Marketing Science, 28*, 120-127.

Song, M., Droge, C., Hanvanich, S., & Calantone, R. (2005). Marketing and technology resource complementarity: an analysis of their interaction effect in two environmental contexts. *Strategic Management Journal, 26*, 259-276.

Spanos, Y., E., & Lioukas, S. (2001). An examination into the causal logic of rent generation: Contrasting Porter's competitive strategy framework and the resource-based perspective. *Strategic Management Journal, 22*, 907-934.

Spector, P. E. (2006). Method Variance in Organizational Research: Truth or Urban Legend? *Organizational Research Methods, 9*, 221-232.

Srivastava, R. K., Shervani, T. A., & Fahey, L. (1998). Market-based assets and shareholder value: A framework for analysis. *Journal of Marketing, 62*, 2-18.

Teece, D. (2007). Explicating Dynamic Capabilities: The Nature and Microfoundations of (sustainable) Enterprise Performance. *Strategic Management Journal, 28*, 1319-1350.

Thomke, S., & Kuemmerle, W. (2002). Asset accumulation, interdependence and technological change: evidence from pharmaceutical drug discovery. *Strategic Management Journal, 23*, 619-635.

Tripsas, M. (1997). Unraveling the process of creative destruction: Complementary assets and incumbent survival in the typesetter industry. *Strategic Management Journal, 18*, 119-142.

Tushman, M. L., & Anderson, P. (1986). Technological Discontinuities and Organizational Environments. *Administrative Science Quarterly, 31*, 439-465.

Vandenberg, R. J., & Lance, C. E. (2000). A Review and Synthesis of the measurement invariance literature: suggestions, practices, and recommendations for organizational research. *Organizational Research Methods, 3*, 4-70.

Verona, G., & Ravasi, D. (2003). Unbundling dynamic capabilities: An exploratory study of continuous product innovation. *Industrial and Corporate Change, 12*, 577-606.

Vorhies, D., Orr, L., & Bush, V. (2011). Improving customer-focused marketing capabilities and firm financial performance via marketing exploration and exploitation. *Journal of the Academy of Marketing Science, 39*, 736-756.

Vorhies, D. W., Harker, M., & Rao, C. (1999). The capabilities and performance advantages of market-driven firms. *European Journal of Marketing, 33*, 1171-1202.

Vorhies, D. W., & Morgan, N. A. (2005). Benchmarking Marketing Capabilities for Sustainable Competitive Advantage. *Journal of Marketing, 69*, 80-94.

Wedel, M., & Kamakura, W. A. (2000). *Market Segmentation: Conceptual and Methodological Foundations*. Boston: Kluwer.

Wilden, R., Gudergan, S., Nielsen, B. B., & Lings, I. (2013). Dynamic Capabilities and Performance: Strategy, Structure and Environment. *Long Range Planning, 46*, 72-96.

Winter, S. (2003). Understanding dynamic capabilities. *Strategic Management Journal, 24*, 991-995.

Wold, H. (1980). Soft Modelling: Intermediate between Traditional Model Building and Data Analysis. *Mathematical Statistics, 6*, 333-346.

Wu, L.-Y. (2010). Applicability of the resource-based and dynamic-capability views under environmental volatility. *Journal of Business Research, 63*, 27-31.

Yalcinkaya, G., Calantone, R. J., & Griffith, D. A. (2007). An examination of exploration and exploitation capabilities: implications for product innovation and market performance. *Journal of International Marketing, 15*, 63-93.

Yarbrough, L., Morgan, N. A., & Vorhies, D. W. (2011). The impact of product market strategy-organizational culture fit on business performance. *Journal of the Academy of Marketing Science, 39*, 555-573.

Zahra, S., & George, G. (2002). Absorptive Capacity: A Review, Reconceptualization, and Extension. *Academy of Management Review, 27*, 185-203.

Zahra, S., Sapienza, H., & Davidsson, P. (2006). Entrepreneurship and Dynamic Capabilities: A Review, Model and Research Agenda. *Journal of Management Studies, 43*, 917-955.

Zhou, K. Z., & Li, C. B. (2010). How strategic orientations influence the building of dynamic capability in emerging economies. *Journal of Business Research, 63*, 224–231.

Zhou, K. Z., & Wu, F. (2009). Technological capability, strategic flexibility, and product innovation. *Strategic Management Journal, 31*, 547-561.

Zollo, M., & Winter, S. (2002). Deliberate learning and the evolution of dynamic capabilities. *Organization Science, 13*, 339-351.