

A contingency model of marketing dashboards and their influence on marketing strategy implementation speed and market information management capability

Model of marketing dashboards

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Abstract

Purpose – This paper aims to focus on the value of marketing dashboards, a key area of interest for scholars and practitioners. This study examines two critical outcomes of marketing dashboards: marketing strategy implementation speed and market information management capability. Additionally, the research analyzes the impact of the firm's internal structure on the relationship between marketing dashboards and the outcomes.

Design/methodology/approach – A conceptual model grounded in the knowledge-based view of the firm is tested. The research uses survey data collected from marketing professionals employed within business-to-business firms. Data from the key informants are analyzed using structural equation modeling.

Findings – The results demonstrate that marketing dashboards are significantly related to marketing strategy implementation speed and market information management capability. Centralization exhibits a negative moderating effect, and formalization exhibits a positive moderating effect on the relationship between marketing dashboards and marketing strategy implementation speed. Marketing strategy implementation speed and market information management capability are related to market performance.

Originality/value – Through the examination of main and moderating relationships, this paper demonstrates that marketing strategy implementation speed and market information management capability are key integration mechanisms that leverage the marketing dashboard resources.

Keywords Performance, Marketing strategy, Dashboard, Market information management capability, Marketing strategy implementation speed

Paper type Research paper



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1. Introduction

The instability of the global economy, fierce global competition and rapid technological changes have heightened the importance of marketing measurement and analytics. A firm's ability to use the right metrics and take action on the collected insights is a challenge (Pauwels, 2015). A marketer without the means or capacity to use marketing analytics and measurement systems, such as marketing dashboards, may create a negative perception regarding marketing accountability within their respective firm. A negative perception regarding marketing's abilities can undermine the credibility of marketing efforts, diminish marketing's role within strategic dialogues, and even "threaten marketing's existence as a distinct capability" (Rust *et al.*, 2004, p. 76).

Industry investment in marketing measurement and analytics is substantial with total global expenditures in marketing dashboards, analytic software and other marketing software systems totaling approximately US\$24bn annually (Lazich *et al.*, 2016). Similarly, academic researchers have demonstrated a keen interest in the topic by addressing questions related to the effective measures of marketing performance (Ambler *et al.*, 2004; Ambler and Roberts, 2006), managerial perceptions toward marketing performance (Clark, 2000; Lehman, 2004; Frösén *et al.*, 2013) and the integration of different perspectives while assessing marketing productivity (Morgan *et al.*, 2002; Rust *et al.*, 2004).

One specific area encompassed by the marketing measurement and analytics area is marketing dashboards. As a marketing-technology resource, marketing dashboards are a valuable tool in advancing toward market performance (Pauwels *et al.*, 2009). Marketing dashboards combine marketing and financial data and analytical tools. The information may be comprised of pre-set metrics or immediate analysis combined with the capability to display elements of marketing programs and activities (O'Sullivan and Abela, 2007). The strategic value of marketing dashboards lies in their ability to provide marketers "a better understanding of the marketing processes that are relevant for their business" (Pauwels *et al.* 2009, p. 10). This information enables a firm to determine plausible connections and relationships (Mone *et al.*, 2013) and improve decisions (Pauwels *et al.*, 2009).

However, the research focused on marketing dashboards has been primarily conceptual rather than empirical (Pauwels *et al.*, 2009). The scant empirical literature on this topic has established that marketing dashboards do not have a direct effect on the firm performance (O'Sullivan and Abela, 2007; O'Sullivan *et al.*, 2009); yet, little attention has been focused on other paths through which marketing dashboards aid in improving market performance. Hence, the link between marketing dashboard utilization and market performance remains relatively unexplored.

To address this research gap, we developed and tested a conceptual model based on the knowledge-based view (KBV) theory (Grant, 1996). The KBV highlights the importance of knowledge-based resources, such as marketing dashboards, and their deployment as a means to enable capabilities and complex decisions that enable a firm to secure a competitive advantage. In our context, KBV outlines the means through which marketing dashboard information is integrated into a firm, thereby impacting behaviors, decisions and ultimately performance (Eisenhardt and Santos, 2002). Specifically, KBV suggests that two forms of knowledge integration mechanisms are applicable: capabilities and decision-making. Further, KBV theorists note that the

effects of the integration mechanisms rely upon understanding the firm's structural conditions and its external conditions (D'Aveni, 1994; Eisenhardt and Santos, 2002).

Therefore, we use KBV as the theoretical lens that guides our examination of marketing dashboards and their impact on market performance. Our model integrates two mediating mechanisms: market information management capability (i.e. capability) and marketing strategy implementation speed (i.e. decision-making) as a means to link marketing dashboards to market performance. Further, we examine whether these relationships are contingent on the firm's internal structure.

Thus, our study contributes to the literature by broadening our understanding of the effects of marketing dashboards, testing important knowledge integration mechanisms that link marketing dashboards to market performance and analyzing the contingent influence of two structural factors on the relationships between marketing dashboards and the integration mechanisms.

The paper is developed in the following manner. First, we summarize the relevant literature that provided the conceptual framework for the study. Next, we provide arguments for our hypotheses and followed by a description of our research methodology. We then submit the results of the analysis using data from senior marketing managers. The paper concludes with a discussion of the results and opportunities for future research.

2. Theoretical background

The KBV focuses on knowledge formation and considers knowledge as the most strategically significant firm resource and a key variable in predicting firm performance (Grant, 1996; Morgan *et al.*, 2003). Within this perspective, a primary role of the firm is to be a knowledge-integrating institution (Eisenhardt and Santos, 2002; Grant, 1996). As a knowledge-integrating institution, the firm's knowledge management processes are strategically valuable because they provide the firm with an "ability to develop and utilize a base of intellectual assets in ways that impact the achievement of strategic goals" (Morgan *et al.*, 2003, p. 290). Hence, knowledge resources must be integrated within the firm to enhance business performance.

To enable the pathway between knowledge resources and performance, the firm must possess the necessary knowledge integration mechanisms. The literature suggests key integration mechanisms may include capabilities and decision-making (Grant, 1996). The underlying premise is that effective integration is not achieved by the utilization of a singular mechanism, but instead the simultaneous use of distinct mechanisms. Further, the firm's structural characteristics play a role in this knowledge integration process (Grant, 1996). Structural elements provide an understanding of whether the firm's internal structure reinforces or hinders the link between knowledge resources and their integration within the firm (Grant, 2013).

To operationalize the pathway of a knowledge resource and its impact on an organization's performance, we developed a conceptual model that incorporates an informational resource that enables the acquisition and dissemination of market information (Hult, 2011) and the integration of this market information through two mechanisms (i.e. organizational capabilities and decision-making) that transform the market information into meaningful knowledge that enhances performance (Nonaka, 1994; Von Krogh *et al.*, 2001). In summary, our conceptual model aligns with the theoretical underpinnings of the KBV (Figure 1).

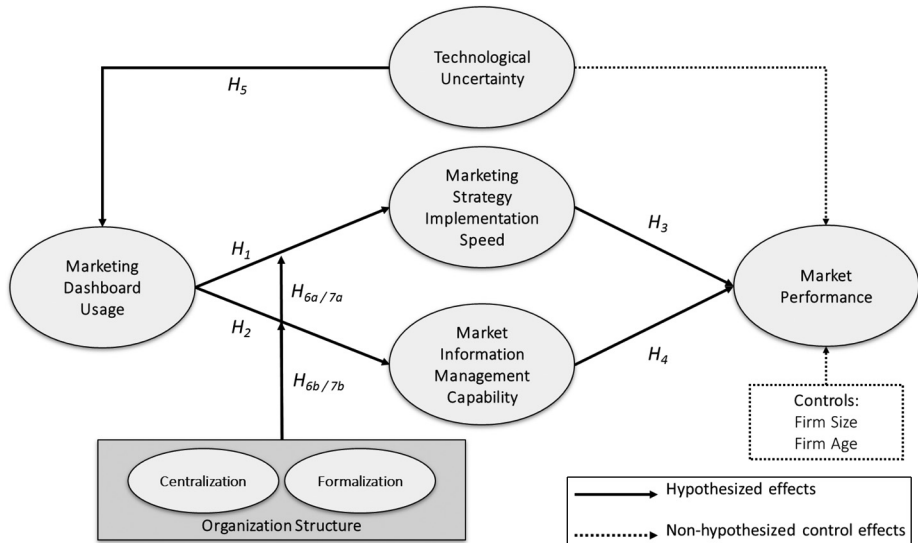


Figure 1.
Hypothesized model

Our conceptual model begins with marketing dashboards, an informational resource (Morgan *et al.*, 2002). Marketing dashboards are a visual assemblage of marketing indicators and metrics, arising from the business intelligence area (Mone *et al.*, 2013). Dashboards have emerged as vehicles for marketing managers and executives to provide evidence that marketing is delivering value and that it plays an important role within the firm (Miller and Cioffi, 2004). For example, Unisys, a global information technology firm, implemented the *Unisys Marketing Dashboard* in 2002 to address the challenge of marketing accountability and demonstrate marketing impact and return on investment (ROI). Marketing dashboards allowed Unisys to track the performance of individual marketing activities, demonstrate how each activity contributes to corporate objectives, identify performance improvement opportunities and provide tangible evidence of impact on corporate goals (Miller and Cioffi, 2004). Marketing dashboards, therefore, facilitate the acquisition and dissemination of vital information and provide assistance in strategic decision-making, resource deployments and strategic alignment (Patterson, 2007). Research examining formalized information systems, under which dashboards can be classified, suggests such systems enable strategy implementation and lead to performance outcomes (Henri, 2006).

In terms of the mechanisms through which marketing dashboard information is integrated into the firm (Grant, 1996), we incorporate market information management capability. The use of market information has been touted as critical for developing efficiency and effectiveness in marketing activities (Wilson, 2000) and enabling performance. Similarly, a market information management capability serves as a means to use market information to understand relevant cause-and-effect marketing relationships and help managers better understand these relationships (Homburg *et al.*, 2012).

The second relevant KBV mechanism is decision-making. Decision-making serves as a mechanism for integrating critical and complex information within the firm (Grant,

1996). Because strategy is one of the important and critical elements leading to firm performance (Hult, 2011), we use marketing strategy implementation speed as a variable that captures strategy and decision-making. Marketing strategy implementation speed describes the pace of decision-making from formulation to implementation (Atuahene-Gima and Murray, 2004).

Further, KBV suggests that internal structures play a critical role in a firm's knowledge integrations system (Grant, 1996). To realize the true value of resources, managers must understand the alignment with "important marketing organization [...] elements" (Hult, 2011). For instance, the firm's internal structure plays a key role in the successful implementation of overall business strategy (Vorhies and Morgan, 2005). Similarly, scholars underscore the incorporation of a firm's structural context when studying resources and capabilities (Vorhies and Morgan, 2005). Firm structure impacts informational channels and pathways in two manners: the type and ways in which knowledge is communicated and integrated (Grant, 1996), and the participation with and coordination of activities within the firm (Thorpe and Morgan, 2007). Therefore, we include elements of the business unit's internal structure (i.e. centralization and formalization) that may moderate the link between the firm's marketing dashboards and its proposed relationships.

Finally, researchers emphasize that environmental conditions influence resource deployment and that firms deploy a variety of resources as proactive mechanisms to cope with environmental conditions (Aldrich, 2008; Eisenhardt, 1989; Zeithaml and Zeithaml, 1984). Grewal and Tansuhaj (2001) found that firms in technologically uncertain markets are more likely to allocate greater resources to technology so that the firm can manage the uncertainty resulting from these turbulent environments. Similarly, research has found that firms in technologically turbulent environments can create a competitive advantage through the deployment of marketing and technology resources (Song *et al.*, 2005). Consequently, our goal is to examine how the environment influences the deployment of marketing dashboards, viewed here as a marketing-technology resource.

In sum, we examine the value of one organizational resource, marketing dashboards, and explain its relationship to the implementation of marketing strategy and the capability to manage market information. Further, we apply a contingency perspective to evaluate the impact of organizational structure and assess the role of the environment on the deployment of marketing dashboards.

2.1 Dashboards and marketing strategy implementation speed

We purport that a positive relationship exists between the use of marketing dashboards and marketing strategy implementation speed. Marketing strategy implementation speed denotes the pace of decisions and activities that occur from the time a marketing strategy is formulated to the time it is implemented in the marketplace (Atuahene-Gima and Murray, 2004). The literature notes that marketing dashboard information impacts the strategic planning and decision-making process (Pauwels *et al.*, 2009). In a similar vein, we argue that the use of marketing dashboards positively impacts the degree of marketing strategy implementation speed in two ways.

First, marketing dashboards provide access to real-time data, which is critical to strategy implementation (Webster *et al.*, 2005). Marketing dashboards provide access to an immediate and more precise view of marketing and business information that is vital

to managerial decision-making (Wind, 2005). By doing so, marketing dashboards can “bring attention to critical trends, prompt preventative action, trigger investment to seize emerging opportunities”, and serve as a critical element to enhance the speed of decision-making and strategy execution (Allio, 2012, p. 24). With this more real-time perspective of the environment, marketing decision makers are able to more accurately predict target market needs and develop more comprehensive means to meet these needs.

Second, dashboards compile a range of financial, non-financial and marketing-program information and channel them into a central resource for review (O’Sullivan and Abela, 2007). By having a wide range of information available for review, strategic decision makers are provided an integrated perspective of relevant data, which enable greater market understanding (Baum and Wally, 2003) as well as a more comprehensive examination in a concise period (Cravens, 1998). The literature reaffirms that comprehensive analysis and understanding are critical elements that enhance the speed of decision-making (Baum and Wally, 2003; Eisenhardt, 1989). In summary, we hypothesize that greater marketing dashboard use will yield greater marketing strategy implementation speed:

H1. Marketing dashboard usage will have a positive effect on marketing strategy implementation speed.

2.2 Dashboards and market information management capability

We argue that marketing dashboard usage positively affects a firm’s market information management capability. The information technology literature broadly defines information management capability as (Mithas *et al.*, 2011, p. 238):

[...] the ability to provide data and information to users with the appropriate levels of accuracy, timeliness, reliability, security, confidentiality, connectivity, and access and the ability to tailor these in response to changing business needs and directions.

This stream of literature recognizes the strategic importance of information, as echoed by an executive of Wal-Mart who stated that:

[...] Technology at this point is simply a means to an end. What is really strategic is the use of the information and how we exploit and maximize it. We’re in a business that competes at the speed of information, and my job is to ensure that we present it in such a way that we use it to drive execution and improvements in our business (Mithas *et al.*, 2011, p. 240).

Within the marketing literature, market information management capability is specifically defined as the processes through which “firms learn about their markets and use market knowledge” (Vorhies and Morgan, 2005, p. 82). Dashboards aid the firm in considering “the context (the market) within which the company operates” (Pauwels *et al.*, 2009, p. 5), which is critical for the market information management capability. Dashboards enable the firm to make greater use of its market information and connect the cause and effect variables, to evaluate customer and competitor actions and related outcomes (Homburg *et al.*, 2012; Luca and Atuahene-Gima, 2007) and to provide critical feedback regarding progress (Marinova *et al.*, 2008; Raps, 2004).

Further, marketing dashboards provide the capacity for the firm to learn about its markets, which is an input for an effective market information management process. Marketing dashboards assemble and make available key measures and market

information, thereby providing an opportunity for learning and improving (Farris *et al.*, 2006; Verhoef and Leeflang, 2009). Dashboards present information in a manner that facilitates integration rather than overload because it is delivered in a value-added format that is condensed, synthesized and represented visually (Eppler and Mengis, 2004). Hence, marketing dashboards provide the opportunity to leverage and analyze data that enables learning. Therefore, a positive relationship is purported between the use of marketing dashboards and the market information management capability:

H2. Marketing dashboard usage will have a positive effect on market information management capability.

2.3 Implementation speed, market information management capability and market performance

A rapid marketing implementation is one way to garner a competitive advantage (Meyers *et al.*, 1999) because it creates the opportunity to claim first-mover advantage and provide greater barriers to competition and, ultimately, financial gain. Firms that can increase their marketing strategy implementation speed will reap market-based rewards because superior execution helps facilitate key outcomes such as faster product introductions, more effective delivery of communication messages and greater maximization of pricing initiatives (Noble and Mokwa, 1999).

The effects of implementation speed are well-documented within the new product development literature (Brown and Eisenhardt, 1995). Implementation speed has been shown to be a predictor of new product success (Gupta and Wilemon, 1990; Lynn *et al.*, 1999). The speed of marketing strategy implementation enables greater alignment with the market (Brown and Eisenhardt, 1995) and more effective use of resources (Swink and Song, 2007). Therefore, this line of logic suggests that the speed of marketing strategy implementation is likely to improve the market performance of a business unit:

H3. Marketing strategy implementation speed will have a positive effect on market performance.

We also suggest a positive relationship exists between market information management capability and market performance. Scholars have highlighted the importance of marketing capabilities and argued that capabilities keep organizations ahead of their competitors and potentially foretell success in their market arena (Wright and Calof, 2006). Marketplace success depends on a firm's capability to increase efficiency and effectiveness by converting embedded knowledge (the tacit knowledge that exists among individuals and teams) to embodied knowledge (the new knowledge that results from the integration of tacit knowledge stores) (Madhavan and Grover, 1998). Similarly, market performance is enhanced by the organization's ability to effectively transform resources through the integrative processes of capabilities (Barney, 1991; Krasnikov and Jayachandran, 2008).

Further, a firm's market information management capability enables the transformation of disparate and complex information, an ability to use this market information to develop competitive marketing programs, and the overall application of this market information (Vorhies and Morgan, 2005). Through market information management capability, a firm will be able to generate market knowledge that is an organized (systematically processed) and structured (endowed with useful meaning) form of information about the market (Li and Calantone, 1998). The ability to use market

information may enable the firm to develop new customer relationships or solidify existing customer relationships, thereby providing provide the firm with a competitive advantage over its competitors (Menon and Varadarajan, 1992). The ability of managing market information has also been shown to impact performance in other marketing-related domains. In the product innovation literature, market knowledge is positively related to forms of performance (Atuahene-Gima, 2005; Li and Calantone, 1998). Formally stated:

H4. Market information management capability will have a positive effect on market performance.

2.4 Technological uncertainty and dashboards

We argue that technological uncertainty, the pace and degree of innovation and change in an environment (Grewal and Tansuhaj, 2001) will influence the firm's utilization of marketing dashboards. Uncertainty within the technological environmental may decrease the firm's ability or confidence to understand the present or future state of the environment (Milliken, 1987). A better understanding of the environment often requires real-time information flow and fast information processing (Atuahene-Gima and Li, 2004). Therefore, as a greater degree of technology uncertainty occurs, the firm may seek methods to streamline its ability to understand a complex environment and seek information resources such as marketing dashboards to assist with its decision-making (Milliken, 1987). Hence, the greater the technological uncertainty, the more likely the firm would use marketing dashboard as a means to access real-time market information to build greater confidence in understanding the complexity of its environment. Building from this, we suggest that technological uncertainty will influence a firm's use of marketing dashboards:

H5. Technological uncertainty will have a positive effect on marketing dashboard usage.

2.5 Contingency factors: structural characteristics of the firm

Business unit structure outlines the allocation and arrangement of responsibility, authority and control within an organization (Ulrich and Lake, 1990). One common means of studying organizational structure is by examining the elements of centralization and formalization (Vorhies and Morgan, 2003).

2.5.1 Centralization. Centralization denotes the degree to which the authority for decision-making is concentrated (Olson *et al.*, 2005a, 2005b). In a highly centralized structure, the discretion to make decisions is often reserved for those at the highest level of the organization (Love *et al.*, 2002), and this structure provides top management with control of marketing activities and information (Vorhies and Morgan, 2003). According to Ruekert *et al.* (1985), centralization is likely to be less effective in situations "when tasks are non-routine, hard to assess, and occurs within a rapidly changing environment" (p. 18). A centralized structure creates an organizational environment that hinders the relationship between marketing dashboards and marketing strategy implementation speed by reducing broad levels of participation (Vorhies and Morgan, 2003), and by limiting access to information (Eisenhardt, 1989). First, a centralized structure does not perpetuate a participative, informal work structure (Vorhies and Morgan, 2003). Without broad participation, the ability to integrate a range of

viewpoints into a comprehensive analysis is limited. When the firm reduces its ability to leverage diverse thinking and its ability to incorporate multiple perspectives regarding the information emanating from marketing dashboards the flow of strategic ideas may be reduced, the likelihood of errors in decision-making may increase (Bergh, 1998) and strategic response times may lag (Olson *et al.*, 2005b).

Similarly, a centralized structure may impact the ability to access the information on marketing dashboards. This lack of access may inhibit the distribution and integration of marketing information from dashboards into the strategic implementation process. Due to the value of the real-time information coming from marketing dashboards, a centralized structure would reduce the speed of dispersing this timely information and thereby reduce the speed of decision-making.

We also suggest that centralization may attenuate the relationship between the use of marketing dashboards and the market information management capability. Centralization concentrates the control and integration of information from the dashboards with top management (Vorhies and Morgan, 2003). The literature notes that when the firm needs to integrate a range of varied information, a centralized decision-making process is not a preferred structure (Nickerson and Zenger, 2004). Under a centralized structure, the concentration of information resides at the top-tiers of management, resulting in fewer organizational members acquiring the information from a marketing dashboards, analyzing the information, making full use of it and integrating it into marketing programs. A disconnect may occur because the decision-making does not necessarily reside within the level of the organization that possesses the knowledge to aid in understanding the information (Grant, 2013). Hence, a centralized process may attenuate the relationship between marketing dashboards and market information management capability:

- H6. Centralization will attenuate the relationships (a) between marketing dashboard usage and marketing strategy implementation speed and (b) between marketing dashboard usage and market information management capability.

2.5.2 Formalization. Formalization is defined as the degree to which rules and protocols that influence decision-making and the firm's actions exist within the business unit (Vorhies and Morgan, 2003). We argue that the greater the level of formalization within the firm, the more positive the relationship between marketing dashboards and marketing strategy implementation speed. Formalization enables greater efficiency and precision of organizational actions (Auh and Menguc, 2007). Thus, a formalized structure may enact prescribed routines and guidelines that more efficiently direct and communicate critical information about the market to strategic decision makers (Baum and Wally, 2003). A formalized structure also focuses the organization on a shared objective, plots a path of action and diagrams the means to goal accomplishment (Auh and Menguc, 2007). Hence, greater formalization imbues strategic decision makers with a comprehension of the approach(es) required within the organization to more rapidly use marketing dashboard information within the marketing strategy implementation process (Baum and Wally, 2003). Further, the literature demonstrates that policies and guidelines enable coordination within the firm, which can effectively speed up organizational processes (Atuahene-Gima and Li, 2000), such as marketing strategy implementation speed.

We also suggest that formalization creates a structure that positively moderates the relationship between marketing dashboards and market information management capability. Rules and procedures are key to enabling the transformation of information to more explicit knowledge (Grant, 1996). As applied to our study's context, we expect that a highly formalized structure will result in a systematic and standardized approach toward the utilization and analysis of the information emanating from marketing dashboards. A formalized structure enables the firm to better leverage the information provided by marketing dashboards and transform this information into knowledge and application through the market information management capability. Hence, we suggest the following hypothesis:

- H7. Formalization will strengthen the relationship (a) between marketing dashboards and marketing strategy implementation speed and (b) between marketing dashboards and market information management capability.

2.6 Mediating mechanism

The relationship between the use of marketing dashboards and performance is not well corroborated within the literature (O'Sullivan and Abela, 2007; O'Sullivan *et al.*, 2009). We suggest that this may, due to the lack of mediating mechanisms, be tested in the relationship between the use of marketing dashboards and performance. The KBV contends that integration mechanisms serve as the vehicle that transforms market knowledge into market performance because they provide a structure for the transfer and learning from knowledge resources (Grant, 1996). For example, integration mechanisms, such as a market informational management capability, provide a means to apply the market knowledge emanating from marketing dashboards (Vorhies and Morgan, 2005) to provide greater organizational insight toward the development of customer relationships (Menon and Varadarajan, 1992). Similarly, decision-making processes, such as marketing strategy implementation speed, provide a means to apply knowledge to more complicated issues, thereby enabling the firm to align with market needs (Brown and Eisenhardt, 1995). As the firm increasingly uses a marketing dashboard, we suggest that market information capability and marketing strategy implementation speed are critical elements that lead to greater market performance. As such, we hypothesize:

- H8. The relationship between marketing dashboards and market performance will be fully mediated by (a) marketing strategy implementation speed and (b) market information management capability.

3. Methods

3.1 Sample

The sample frame was US business-to-business firms. A research firm specializing in data collection was used to aid in the data collection efforts. The firm distributed an e-mail inviting 2,100 randomly selected marketing executives in business-to-business firms to participate due to their understanding of strategy and performance (Slater *et al.*, 2007).

This process served as a means to pre-screen potential participants and ensure they were used in a marketing capacity. From this group, 254 surveys were distributed to the pre-screened key informants who indicated their intent to participate. One-hundred and

fifty-eight individuals returned the surveys. After examining the data for incomplete items, our remaining data sample was 156. In sum, the response rate was 61.4 per cent for respondents who received the survey and a 7.4 per cent response rate from the original sample frame.

We used a time trend test to examine non-response bias and found no significant differences between early and late respondents. The profile of our respondents demonstrates employment in the sectors of information and technology (32.1 per cent), professional services (23.1 per cent), manufacturing (30.1 per cent) and other equipment production and electronics (14.7 per cent). As the literature notes, "For purposes of generalization and resistance to sample bias, diversity in the sample is desirable" (Blair and Zinkhan, 2006, p. 5). Further, the sample respondents' title and rank were managerial, including *chief marketing officer* (5.8 per cent), *vice-president* (16.0 per cent), *director* (15.4 per cent) and *manager*, such as *marketing manager* or *brand manager* (62.8 per cent). Finally, the respondents were highly educated as 85 per cent possessed an undergraduate degree or post-graduate education.

As our study used single informants, we ensure the appropriateness using a number of checks. Following the literature, we included two questions to ensure both involvement and knowledge in the areas focused upon in our study (Lee *et al.*, 2008; Weiss and Heide, 1993). The validation questions asked about the informant's knowledge regarding their business unit's performance, and the informant's respective level of involvement in strategy formulation (Campbell, 1955; Kumar *et al.*, 1993). This was measured on a seven-point scale. The means for the level of involvement were 6.1 and 5.9, respectively, levels similar to other research (Weiss and Heide, 1993). Scholars have used a key informant approach when studying the marketing organization and marketing capabilities (Olson *et al.*, 2005a, 2005b; Vorhies and Morgan, 2005). Further, research has demonstrated the value of key informants' responses of performance-based outcomes (Morgan *et al.*, 2004).

3.2 Measures

We used or adapted existing measures of the constructs in our conceptual model. Measurement scales such as marketing dashboards and market information management capability have been used in past studies (Verhoef and Leeflang, 2009; Vorhies and Morgan, 2003) and exhibited both reliability and validity. The constructs' respective correlations, average variance extracted (AVE) and composite reliabilities (CRs) are shown in Table I.

The *marketing dashboard* construct was measured using a three-item scale from O'Sullivan and Abela (2007). We slightly altered the third item to enhance understanding among the respondents. The *market information management capability* is adopted directly from Vorhies and Morgan (2005). *Formalization* depicts the level to which procedures and protocols that direct the unit's decision-making and actions are present. The construct was operationalized by a seven-point Likert scale, and the items were based on Deshpande and Zaltman (1982). *Centralization* refers to the degree authority for decision-making is concentrated within the business unit. This construct was operationalized by a seven-point Likert scale with three item from Jaworski and Kohli (1993) and one item from Vorhies and Morgan (2003). *Technology uncertainty* were the three items that Grewal and Tansuhaj (2001) used from the Jaworski and Kohli (1993) scale. We transformed the three items into a semantic-differential scale. The

marketing strategy implementation speed variable describes the time between marketing strategy formulation and execution (Atuahene-Gima and Murray, 2004). We adapted the items into a three-item semantic differential scale. *Market performance* is from Homburg *et al.* (2007).

The choice of the two control variables, business unit size and firm age, is based on KBV and organizational learning perspective (Autio *et al.*, 2000; Tsai, 2001). Specifically, the size of the firm or business unit has been used in prior research relating to market performance (Homburg *et al.*, 2007). The theoretical support for this approach emerges from the organizational learning viewpoint (Baker and Sinkula, 1999; Tsai, 2001). As per this viewpoint, the size of a business unit can affect innovation and performance, as the large units tend to have more resources with which to enhance and accelerate the business processes (Tsai, 2001).

Similarly, O'Sullivan and Abela (2007) note that firm age is often identified in the strategy and marketing literature as a variable impacting performance. Literature using KBV (Autio *et al.*, 2000) posits that young organizations possess some learning advantages when it comes to knowledge and growth. The reason being, as firms get older, "unlearning established organizational practices becomes more difficult" (Autio *et al.*, 2000, p. 912). In the context of marketing dashboards that embody a novel resource, researchers have used firm age as a control variable that may impact the performance. Items for all constructs are shown in Appendix Table AI.

To examine measurement reliability and validity, confirmatory factor analysis was used. Model fit indices include the non-normed fit index (NNFI), 0.95; the comparative fit index (CFI), 0.96; and the root mean squared level of approximation, 0.055, (0.045, 0.066). An NNFI and CFI threshold of 0.90 suggests acceptable fit (Hu and Bentler, 1999). Overall, the constructs demonstrate acceptable psychometric properties.

We calculated both CR scores as well as AVE for each construct. CRs exceeded 0.70. In terms of AVEs, the variables with hypothesized main effects met the benchmark of 0.50 (Fornell and Larcker, 1981). The only exception was the technology uncertainty scale. However, as the items emanated from a previously used scale (Grewal and Tansuhaj, 2001), our concerns were attenuated.

Table I.
Correlations,
composite
reliabilities and
average variances
extracted

Hypothesis no.	Constructs	1	2	3	4	5	6	7
1.	Marketing dashboards	–						
2.	Market information management capability	0.44**	–					
3.	Marketing strategy implementation speed	0.17*	0.10	–				
4.	Centralization	–0.12	0.02	–0.18*	–			
5.	Formalization	0.20*	0.22**	–0.07	0.41**	–		
6.	Market performance	0.30**	0.26**	0.21**	–0.10	–0.02	–	
7.	Technology uncertainty	0.39**	0.41**	0.12	–0.01	0.14	0.19*	–
	Composite reliability (CR)	0.90	0.93	0.87	0.86	0.85	0.95	0.68
	Average variance extracted (AVE)	0.74	0.72	0.69	0.61	0.54	0.82	0.41

Notes: * $p < 0.05$ level (significant); ** $p < 0.01$ level (significant)

Discriminant validity was assessed by comparing the squared intercorrelations with the respective constructs' AVE value (Fornell and Larcker, 1981). The AVE exceeded the squared intercorrelation, demonstrating evidence of discriminant validity. Further, we conducted an analysis to understand the level of multicollinearity that exists between the constructs. Our concerns were reduced because the variance inflation factor (VIF) was below the 10.00 threshold (Hair, 2010).

3.3 Common method analysis

To mitigate common method bias, a series of *a priori* and post hoc approaches was used. First, multiple forms of scales were used to disrupt the potential for common method bias (Rindfleisch *et al.*, 2008). Specifically, we adapted marketing strategy implementation speed and technology uncertainty as semantic differential scales, while the marketing dashboard, market information management capability, centralization, formalization and market performance were Likert scales.

The model also incorporated multiple interaction terms, which are not affected by common method bias (Evans, 1985). Further, we conducted two marker variable correlation analyses (Lindell and Whitney, 2001; Podsakoff *et al.*, 2003)[1]. In the first analysis, we incorporated a measure of the business unit's number of mergers and acquisitions over the past five years. When partialing out the variance due to the marker variable, the mean difference between the original associations and the partialled associations was 0.003. In the second analysis, the theoretically unrelated marker variable was a two-item measure of entrepreneurial proactiveness (Matsuno *et al.*, 2002). When partialing out the variance due to the marker variable, the mean difference between the original associations and the partialled associations was 0.006. In both scenarios, the original associations remained significant. As further assurance, we integrated a common method factor into the structural model to account for common method bias in the structural model (Donavan *et al.*, 2004). The cumulative approaches demonstrate that common method variance is unlikely.

3.4 Evaluation of structural model

To analyze the model, structural equation modeling (SEM) was used. To model the latent constructs' interactions, we used the two-step single indicant method (Ping, 1995). Items from the observed variables were standardized to avoid multi-collinearity (Agustin and Singh, 2005). We calculated each interaction term's single indicant along with their respective loadings and measurement errors using the Ping (1995) approach, and we input the indicants, their loadings and measurement errors into the structural equation model. Model fit appeared to be adequate ($\chi^2 = 490.151$, $df = 391$; NNFI = 0.98 CFI = 0.98) (Hu and Bentler, 1999) (Table II).

The results demonstrated that marketing dashboards are significantly related to marketing strategy implementation speed ($\beta = 0.187$, $p < 0.05$), supporting *H1*. Similarly, a positive, direct effect between marketing dashboards and market information management capability ($\beta = 0.476$, $p < 0.05$) provided support for *H2*. Our hypotheses relating to market performance were also supported (*H3* and *H4*), as marketing strategy implementation speed and market information management capability were both found to be positively related ($\beta = 0.208$, $p < 0.05$) and ($\beta = 0.177$, $p < 0.05$), respectively. Our final direct relationship relating technological uncertainty to dashboards (*H5*) was supported ($\beta = 0.558$, $p < 0.05$), suggesting that firms in uncertain

Table II.
Results of analysis

Hypothesis no.	Independent variable	Dependent variable	Standardized coefficient (<i>t</i> -value)	Results
<i>Main effects</i>				
H1	Marketing dashboards	Marketing strategy implementation speed	0.187 (2.134)*	Supported
H2	Marketing dashboards	Market information management capability	0.476 (5.058)*	Supported
H3	Marketing strategy implementation speed	Market performance	0.208 (2.395)*	Supported
H4	Market information management capability	Market performance	0.177 (1.970)*	Supported
H5	Technological uncertainty	Dashboards	0.558 (4.282)*	Supported
<i>Interactions</i>				
H6a	Marketing dashboards × Centralization	Marketing strategy implementation speed	-0.287 (-2.786)*	Supported
H6b	Marketing dashboards × Centralization	Market information management capability	-0.090 (-0.957)	Not supported
H7a	Marketing dashboards × Formalization	Marketing strategy implementation speed	0.354 (3.657)*	Supported
H7b	Marketing dashboards × Formalization	Market information management capability	-0.026 (-0.300)	Not supported
<i>Moderators (non-hypothesized paths)</i>				
	Centralization	Marketing strategy implementation speed	-0.064 (-0.598)	N/A
	Centralization	Market information management capability	-0.127 (-0.832)	N/A
	Formalization	Marketing strategy implementation speed	0.030 (0.347)	N/A
	Formalization	Market information management capability	0.176 (2.059)*	N/A
<i>Control variables</i>				
	Firm size	Market performance	0.070 (0.871)	N/A
	Firm age	Market performance	0.242 (2.930)*	N/A
	Technological uncertainty	Market performance	0.132 (1.275)	N/A
<i>Model fit</i>				
χ^2				0.041 (0.028, 0.052)
<i>df</i>	490.151			0.98
NNFI	0.99			
		RMSEA		
		CFI		

Note: * $p < 0.05$

environments are more likely to deploy marketing-technology resources to contend with uncertainty.

Centralization exhibited a negative moderating effect on the relationship between marketing dashboards and marketing strategy implementation speed ($\beta = -0.287, p < 0.05$) providing support for *H6a*. Yet, the results did not demonstrate the same moderating effect of centralization on marketing dashboards on market information management capability ($\beta = -0.090, p > 0.05$) and, therefore, *H6b* was not supported.

Formalization exhibited a positive effect on the relationship between marketing dashboards and marketing strategy implementation speed ($\beta = 0.354, p < 0.05$), supporting *H7a*. However, formalization was not found to moderate the relationship between marketing dashboards and market information management capability ($\beta = -0.026, p > 0.05$), thus *H7a* was not supported.

To test for the effects of mediation, we began with our hypothesized structural model which demonstrated adequate fit (Table III). Next, we developed a structural model that added a direct path from marketing dashboards to market performance into the hypothesized model. This full structural model did not demonstrate a fit greater a significant improvement in fit ($\Delta\chi^2 = 1.451, df = 1$) over the hypothesized model. In addition, the direct effect between marketing dashboards and market performance was not statistically significant ($\beta = 0.170, n.s.$). The results suggest the relationship between marketing dashboards and market performance is fully mediated through market information capability and marketing strategy implementation speed.

We also tested an alternative model (Table III). In the alternative model, we added a path between market information management capabilities to marketing implementation speed into the hypothesized model. Again, we did not find a significant path between the market information capability and marketing strategy implementation speed ($\beta = -0.022, n.s.$)[2].

4. Discussion

While industry investments suggest the general appeal of marketing dashboards, the empirical understanding of their value to market performance has been relatively scant. Our research provides greater direction regarding the effects of marketing dashboards.

First, the marketing literature notes the lack of empirical understanding surrounding marketing dashboards (Pauwels *et al.*, 2009). Previous studies examining marketing dashboards failed to demonstrate a positive or statistically significant relationship to firm performance (O'Sullivan and Abela, 2007; O'Sullivan *et al.*, 2009). In contrast, our study incorporates two knowledge-integrating mechanisms as pathways from marketing dashboards to market performance. In doing so, we overcome the challenges of past research in demonstrating the performance impact of marketing dashboards (O'Sullivan and Abela, 2007; O'Sullivan *et al.*, 2009).

Second, our study tests the contingent conditions of organizational structure on the relationship between marketing dashboards and the two integration mechanisms. By doing so, we examine the structural conditions that enable marketing dashboard information to be integrated within the firm. The results demonstrate that a centralized structure attenuates the relationship between marketing dashboards and marketing strategy implementation speed. In effect, a decentralized structure allows for the information emanating from a marketing dashboard to be integrated into knowledge at the appropriate structural level of decision-making (Grant, 1996). A decentralized

Table III.
Results of mediation
analysis and
additional analysis

Additional model paths tested	Standardized coefficient (<i>t</i> -value)	NNFI	CFI	χ^2	<i>df</i>	χ^2 difference test
Hypothesized model (i.e. <i>base model</i>)	N/A	0.98	0.98	490.151	391	N/A
H8 base model + marketing dashboard → market performance	0.170 (1.361)	0.98	0.98	488.700	390	1.451 (1)*
Base model + market information management capability → marketing implementation speed	-0.022 (-0.214)	0.97	0.98	566.747	390	76.596 (1)**

Notes: *Not statistically significant; **Statistically significant ($p < 0.05$); however model fit decreased

structure provides an organizational environment conducive to enabling the information from marketing dashboards to be more readily integrated throughout the organization, including to those individuals making and implementing marketing strategy decisions, thereby increasing the pace of strategic decision-making. In addition, we find that formalization may enhance the relationship between marketing dashboards and marketing strategy implementation speed. The policies and procedures inherent within a formalized structure provide prescriptive guidance in using market information in the decision-making process.

Conversely, our results do not demonstrate a structural boundary condition impacting the relationship between marketing dashboards and market information management capability. Our findings suggest that once a market information management capability is developed, the firm's internal structure will not impact its ability to integrate the information from marketing dashboards. We also highlight that the use of a focused marketing capability as an integration mechanism is relatively unique to the marketing literature. Morgan (2012) notes the lack of attention focused on individual marketing capabilities that are "central to the practice of marketing" (p. 114). Hence, our analysis sheds unique insight on a specific marketing capability that has received scant attention in the literature.

Further, our additional analyses confirm that the two knowledge-integrating mechanisms fully mediate the relationship between marketing dashboards and market performance. Hence, we demonstrate the valuable role that knowledge-integrating mechanisms play in enabling the pathway from marketing dashboards to market performance. This finding is an important contribution because research has suggested that focus should be directed toward elaborating the benefits related to the use of dashboards (Lehman, 2004).

Our research also contributes to the strategy literature, as speed in strategy implementation is increasingly important in the current business environment. Scholars have called for a better understanding of the drivers of marketing strategy implementation (Slater *et al.*, 2010). We meet this call by examining the link between marketing dashboards and marketing strategy implementation speed. We demonstrate the strategic role in the firm played by marketing dashboards. Their main and moderated effects show that marketing dashboards impact marketing strategy implementation speed.

4.1 Managerial implications

Our findings also provide managerial guidance. First, the results demonstrate that dashboards are managerially relevant and support the financial investment that firms are deploying in marketing dashboards. We submit that a firm should pause before implementing a marketing dashboard. As our analyses demonstrate, the value of a critical capability, such as a market information management capability, and decision-making processes related to marketing strategy implementation speed can improve the capacity of the firm to leverage their investment in marketing dashboards.

Second, the value of marketing dashboards lies in their ability to increase marketing strategy implementation speed. Our results suggest a formalized and decentralized structure can aid in enhancing the relationship between marketing dashboards and marketing strategy implementation speed. Firms that provide procedures, protocols and policies in areas such as the use and distribution of marketing dashboard

information may be well served in reinforcing their ability to integrate the marketing dashboard information into their strategic decision-making efforts. Such a process may reinforce the ability to make the most out of the application of information provided by a marketing dashboard. Similarly, a decentralized structure is also important to enable the firm to enable the relationship between marketing dashboards and marketing strategy implementation speed. The ability to provide the information to those involved in the strategic decision-making process is important to enabling speed (Baum and Wally, 2003). Hence, the managerial value regarding our findings is increasingly important. The swiftness of moving from formulation to execution is critical, as competition is increasingly time-based, as speed has emerged as key competitive advantage. For instance, much of Amazon's success emanates from its strategic speed, with some suggesting that its CEO, Jeff Bezos, has turned Amazon into an "unprecedented speed demon [...]" (McCorvey, 2013).

Third, our study suggests that managers may find marketing dashboards valuable in external conditions that possess technology uncertainty. For managers, a technologically uncertain environment may provide the impetus to increasingly use marketing dashboards to enable the understanding of this environmental complexity and assist with decision-making in such an environment (Milliken, 1987).

4.2 Limitations and future research

Like any other research project, our study has limitations. Our sample size may be considered a limitation. However, other studies have used a similar sample size when using SEM (Briggs *et al.*, 2012; Onyemah *et al.*, 2010), and research suggests that sample size alone does not invalidate the results from SEM (Bagozzi and Yi, 2012).

Some challenges may emanate from the use of key respondents. However, the marketing and marketing strategy literature often used single informants when studying elements of the marketing organizations, resources and marketing capabilities (Olson *et al.*, 2005b; Vorhies and Morgan, 2005) and studies related to marketing metrics (Mintz and Currim, 2013, 2015). Similarly, previous research has supported the validity of the responses from key informants regarding performance-based outcomes (Homburg *et al.*, 2007; Morgan *et al.*, 2004). Hence, this research combined with our confirmation of the informant's knowledge and involvement has reduced our concern in this area.

The cross-sectional nature of the data could also be complemented by integrating longitudinal data, thereby capturing the dynamic aspects of marketing strategy implementation issues. Nonetheless, findings of the current study still contribute to the stock of knowledge on marketing strategy implementation and market information management capability by highlighting the direct and interaction effects of the firm's structural characteristics of marketing dashboards. Further, we draw heavily from KBV and its logic that the firm's knowledge base is leveraged through informational capabilities yielding performance. Hence, we suggest that the theoretical basis for our model mitigates some concerns regarding model specification.

One of the variables in our model, technology uncertainty, demonstrated lower levels of AVE and CRs. While it was the only exception of our variables not meeting the thresholds, our concerns were tempered, as the items originated from a previously used scale (Grewal and Tansuhaj, 2001).

Another limitation of this research stems from the use of self-reported data from marketing professionals who were educated and were operating at managerial positions in their respected organizations. To control common-method bias, we conducted a number of *a priori* and post hoc tests. Although we accept common-method limitations, it should not diminish the contribution of our interactive model, as scholars (Evans, 1985) suggest that a respondents' inability to determine the complex relationships balances out the common method bias in such cases. Nonetheless, future studies should aim to collect data from different sources, such as gathering performance data from archival records, to enhance credibility of the findings.

In a related manner, we highlight the need for future studies to examine the capacity for other marketing capabilities to integrate the information emanating from marketing dashboards. Marketing dashboards can communicate important information to key stakeholders across the organization, and a better understanding of how this information can be effectively integrated into decision-making processes is warranted. Such explorations would be fruitful on two fronts. Not only would they enable greater insight into the pathways through which marketing dashboards work but they would also provide greater understanding of the effects of individual marketing capabilities, an area with minimal understanding at this time (Morgan, 2012).

Our findings reaffirm the literature in that structure is a critical facilitator of strategy implementation (Vorhies and Morgan, 2003; Walker and Ruekert, 1987); the firm's structure impacts the integration of knowledge and information (Thorpe and Morgan, 2007). In sum, our study suggests that internal structure should be included in future examinations using the KBV as well as when testing other integration mechanisms in relation to marketing dashboards.

While our research looks at moderating influences on the relationships between marketing dashboards and capabilities, our model does not take into consideration the contingent effects that strategic orientations have on the dashboard-capabilities-performance chain. Future research incorporating the influence of moderating factors such as strategic orientation or risk orientation of the firm on this causal chain could provide meaningful insights for managers and scholars. Similarly, a number of strategic decision-making variables could be tested and evaluated in future studies to provide a more nuanced understanding of how marketing dashboards interact with organization processes and capabilities to contribute to performance outcomes.

Notes

1. The authors thank an anonymous reviewer for this recommendation.
2. The authors thank an anonymous reviewer for this insight.

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Constructs and items	Standard loading
<i>Use of a marketing dashboard</i>	
O'Sullivan and Abela (2007)	
Seven-point Likert scale	
High level "dashboard" of key marketing performance indicators	0.84
Automated reporting of performance from a full range of marketing activities	0.91
Performance information specific to individual marketing programs	0.83
<i>Marketing strategy implementation speed</i>	
Adapted from Atuahene-Gima and Murray (2004)	
Semantic differential scale	
Faster than major competitors/Slower than major competitors*	0.88
Faster than industry norm/Slower than industry norm*	0.92
Faster than schedule required/Slower than schedule required*	0.68
<i>Market information management capability</i>	
Vorhies and Morgan (2005)	
Seven-point Likert scale	
Gathering information about customers and competitors	0.72
Using market research skills to develop effective marketing programs	0.86
Tracking customer needs and wants	0.79
Making full use of marketing research information	0.92
Analyzing marketing information	0.92
<i>Centralization</i>	
Jaworski and Kohli (1993); Vorhies and Morgan (2003)	
Seven-point Likert scale; Strongly agree/Strongly disagree	
Little action can be taken in this business unit until a supervisor makes a decision	0.80
Decision-making authority is highly centralized in this business unit	0.61
Any decision a person in the business unit makes has to have a boss's approval	0.90
Small matters must be referred to someone with more authority for a final decision	0.78
<i>Formalization</i>	
Deshpande and Zaltman (1982)	
Seven-point Likert scale; Strongly agree/Strongly disagree	
Most people in the business unit follow written work rules for their job	0.75
Everyone within the business unit follows strict operational procedures at all times	0.92
The unit has well defined procedures for all of our business activities	0.80
Going through the proper channels to get the job done is continually stressed	0.63
Responsibilities are clearly defined within the business unit	0.50
<i>Technological environment</i>	
Grewal and Tansuhaj (2001) and Jaworski and Kohli (1993)	
Semantic differential scale	
Stable environment/Dynamic environment	0.61
Rapid technological change/Slow technological change(*)	0.54
Enables few new products/Enables many new products	0.74
<i>Market performance</i>	
Homburg Grozdanovic, and Klarmann 2007	
Seven-point Likert scale; "clearly worse"(1), "competition level"(4) and "clearly better" (7)	
Achieving the desired profit level	0.91
Achieving desired sales level	0.95
Achieving the desired market share	0.87
Overall performance	0.88

Table AI.
Scale items

Note: *Reverse coded

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