



## The effects of market orientation, technological opportunism, and e-business adoption on performance: A moderated mediation analysis

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### ABSTRACT

Understanding the effective adoption of technological innovations, such as e-business, is arguably one of the key challenges facing organizations. The literature indicates that the relationship between firm capabilities and firm performance is mediated by the effects of the adopted innovation (e.g., e-business). However, the complementarity effects of capabilities on the adoption of innovation have received little attention. Drawing on the Resource Based View, this paper examines the complementarity between two firm-specific capabilities [i.e., Market Orientation (MO) and Technological Opportunism (TO)] with regard to e-business adoption (EBA) as well as the mediating effect of EBA on the capability-performance relationship. A moderated mediation analysis revealed that the relationship between MO and EBA is moderated by TO and that EBA partially mediates the effects of MO and TO on firm performance. Implications for theory and practice are discussed regarding bundling capabilities and subsequent complementarity to increase causal ambiguity in order to increase both EBA and firm performance.

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### 1. Introduction

Facilitating business processes through e-business technologies has been highlighted (e.g., Achrol and Kotler, 1999; Rapp et al., 2008) as a critical challenge for all industries and all firms. In fact, the critical question is not whether firms should adopt e-business but how they should deploy e-business to obtain competitive advantage (Porter, 2001). Furthermore, due to the high failure rates in the adoption and implementation of high technological innovations (e.g., Mohr and Shooshtari, 2003), understanding the adoption of technological innovations, such as e-business, is arguably one of the key concerns and challenges in marketing practice (Hauser et al., 2006; McCole and Ramsey, 2005; Hernandez et al., 2009; Trainor et al., 2011). The literature (e.g., Augusto and Coelho, 2009; Hurley and Hult, 1998; Hult et al., 2004; Montealegre, 2002; Narver et al., 2000; Rapp et al., 2008; Srinivasan et al., 2002; Tuominen et al., 2004; Wu et al., 2003) indicates a positive relationship between firm capabilities and the adoption of innovation, including the adoption of e-business technologies. Furthermore, the mediating effects of adopting innovations on the relationship

between firm-specific capabilities and firm performance have been examined. For example, Hult et al. (2004) show that innovativeness defined as the capacity to introduce new process, products or ideas, mediates the effects of firm capabilities such as market orientation and organizational learning on business performance. Whilst, Naidoo (2010) illustrates that marketing innovation mediates the market orientation and competitive advantage relationship.

In the context of e-business adoption, Wu et al. (2003) discuss the mediating effects of e-business adoption between organizational learning, customer and competitor orientation and various firm performance outcomes. However, the complementarity between firm capabilities has received little attention and has been considered only with regards to variables such as firm performance (e.g., Menguc and Auh, 2006). Crucially, the complementarity between firm capabilities on a mediator (e.g., e-business adoption) of the capability-performance relationship has not been examined.

A central tenet of the RBV is that firm capabilities interact with each other. That is, the value of a capability depends on other capabilities (Moorman and Slotegraaf, 1999) due partly to resource uniqueness attained from the reconfiguration and integration of existing capabilities, thereby giving rise to causal ambiguity and subsequently to sustainable competitive advantage (Powell et al., 2006). Consequently, managers are challenged to appropriately allocate resources and to build those capabilities (and address weaknesses) that will deliver value to customers manifesting in superior firm performance as measured by both market-based

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(e.g., market share, customer satisfaction, and customer retention) and financial-based outcomes (e.g., return on investment, shareholder wealth) (Sarkees, 2011; Sirmon et al., 2011).

Capabilities can complement each other, such that the interactions enhance firm performance more than the individual contribution of each capability. For example, Moorman and Slotegraaf (1999) in the new product development literature argue that effective product development is due to a firm possessing both product marketing and product technological capabilities and the resulting complementarity of both these capabilities. Therefore, when capabilities are complementary, a capability may be difficult to develop, not due to its own initial level but due to its complementarity with other capabilities (Dierickx and Cool, 1989). Essentially, complementarity is critical to the firm because the interaction effects of capabilities enhance both effectiveness and efficiency (Park and Zaltman, 1987; Song et al., 2005), and makes imitation difficult due to causal ambiguity (Menguc and Auh, 2006). There have been calls in the literature (e.g., Moorman and Slotegraaf (1999); Song et al., 2005) for examining the complementary effects of marketing and technological capabilities as they are arguably two of the most important determinants of firm performance (Dutta et al., 1999). In the specific context of market orientation and technological opportunism, Srinivasan et al. (2002) call for research to investigate the complementarity of these two capabilities on various firm outcomes. However, in spite of the central importance accorded to complementary resources and capabilities in creation and internal appropriation of economic rents, strategic theories of the firm have tended to under-emphasize their crucial integrative role in explaining competitive advantage (Stieglitz and Heine, 2007). Existing methodologies focus on separately measuring both sets of capabilities (their main effects), and usually neglect the synergies between these complementary capabilities (their interaction effects) which can play a crucial role in the innovation process and augment firm performance (Prasnikar et al., 2008).

This paper applies the RBV to examine the complementarity effects of marketing and technological capabilities (i.e., MO and TO) on a potential mediator (i.e., EBA) of the capabilities-performance relationship. Market orientation is of central interest as it is the cornerstone of marketing strategy, and there remains an ongoing debate regarding its role in innovation (e.g., Hurley and Hult, 1998). Technological opportunism is of interest as it is a key factor in the EBA context given that it refers to sensing and responding to technological developments. To this end, the contribution that this paper makes is twofold:

- (1) It contributes to the RBV literature by examining whether firm capabilities have complementary effects on a potential mediator (i.e., e-business) of the capabilities-performance relationship, and;
- (2) It contributes to the market orientation literature by providing a moderation-mediation analysis of the effects of MO, TO, and EBA on firm performance.

## 2. Theoretical framework

### 2.1. The resource based view of the firm

The RBV has become the dominant theoretical foundation in strategic management (Newbert, 2007; Stieglitz and Heine, 2007) and has been applied to strategic marketing (e.g., Day, 1994; Morgan et al., 2006; Voola and O'Cass, 2010; Zahay and Peltier, 2008). According to Barney et al. (2011), the RBV originated from evolutionary economics, particularly from the work of the economist Penrose (1959), who argued that "services yielded by resources are a function of the way in which they are used – exactly the same resource when used for different purposes or in

different ways and in combination with different types or amounts of other resources provides a different service or set of services" (p. 25). Penrose's (1959) argument suggests that the uniqueness of the organization is based on the way in which the organization bundles its resources and capabilities. Essentially, the RBV attempts to answer the following question: What types of organizational capabilities lead to sustainable competitive advantage?

Scholars have used terms such as resources, capabilities, competencies, skills and assets (Carmeli, 2004) when investigating the RBV. In this paper, Makadok's (2001) perspective will be adopted as the theoretical underpinning of the study. Makadok (2001) argues that a resource is an asset (e.g., brand, license or a patent) that can be observed (although it is not necessarily tangible), valued and traded. In contrast, a capability is an asset that cannot be observed, and consequently is intangible or valued and is traded only in its entirety. Essentially, capabilities alter resources by integrating and recombining them (Eisenhardt and Martin, 2000). For a capability to yield a sustainable competitive advantage it must be imperfectly imitable (King and Zeithaml, 2001).

A key mechanism that protects capabilities from imitation is that of causal ambiguity or the ambiguity concerning the connections between actions and results (Barney, 1991). Furthermore, complementarity, which refers to the marginal return of an activity increasing when it is used with another activity, is a crucial concept in strategy, particularly with regard to causal ambiguity (Milgrom and Roberts, 1995). Complementarity is essential for synergy to develop among complementary capabilities (Stieglitz and Heine, 2007). Ignoring complementarities may lead to a decrease in firm profitability, as the firm fails to realize its full potential due partly to organizational slack (Stieglitz and Heine, 2007). It is arguably the case that the interaction between capabilities that are characterized by high tacitness, complexity, firm specificity and complementarity lead to causal ambiguity, and therefore, to higher firm performance.

### 2.2. Marketing and technological capabilities

Over the past two decades, scholarly research focusing on marketing and technological capabilities has been advanced within strategic marketing and related disciplines. It is now understood in the marketing literature that a firm with a higher level of a marketing capability than its competitors has a better understanding of the needs and behaviours of its customers, and thus can develop a more effective marketing strategy which consequently enables the firm to perform better than its competitors. Furthermore, Krasnikov and Jaychandran (2008, p. 3) argue that marketing capability is "likely to be immune to competitive imitation and acquisition because of the distributed, tacit, and private nature of the underlying knowledge."

With the advent of new information technologies in the past decade, the role of technology itself can no longer be viewed myopically as a facilitator of a firm's processes, but rather, need to be seen as a core element of a firm's strategy (Srinivasan et al., 2002). Technological capability has been argued to be a strategic capability as it enables firms to achieve competitive advantage (Tsai, 2004). Specifically, competitive advantage depends upon the firm's capability to adopt new technologies in a strategic and timely manner (e.g., Lee and Grewal, 2004; Porter, 2001).

In this sense, firms that are technologically opportunistic are utilizing their resources to actively scan markets, often beyond those in which their products compete, for disruptive discoveries that will change the way firms do business (Srinivasan et al., 2002). Managers in these firms actively seek information, knowledge, signals, trends and other indicators that can create market advantages. Firms sense these disruptions through investments in resources, day-to-day activities, and formal and informal

processes that are in place across functional areas, to create a firm-wide capability (Sarkees, 2011).

Due to the inherent differences in capabilities, firms may have varying responses to new technologies (Wernerfelt, 1984). These differences in responses to new technologies and firm capabilities result in heterogeneity in firm performance (Rumelt, 1984). It is argued that TO leads to heterogeneity of firms in sensing and responding to new technologies which may have subsequent effects on firm performance and competitive advantage. Based on the prior arguments, MO and TO are conceptualised in this study as firm capabilities as they involve complex interactions between individuals and departments. These capabilities are thus characterized by intangibility and heterogeneity, both of which may directly or indirectly affect firm performance (Makadok, 2001).

### 2.3. Research model and hypotheses development

The research model for this study was developed by consolidating and synthesising RBV literature, or more specifically, marketing strategy, management and information systems literature. As shown in Fig. 1, the model proposes that there are three key areas upon which the process of establishing firm performance can be understood i.e., financial performance, customer performance and market performance. Within these three key areas, constructs such as Market Orientation, Technological Opportunism and e-Business Adoption, emerge. The following is a description of these constructs and a discussion on their interrelationships.

#### 2.3.1. MO and firm performance

From a capabilities-based perspective, market orientation represents a specific firm-level resource that enables organizations to sense marketplace requirements and develop other capabilities that connect the organization to its external environment (Day, 1994; Slater and Narver, 1995; Song et al., 2007). Market-oriented firms possess the cultural characteristics that enable them to diagnose their current capabilities, anticipate future capabilities and redesign processes to support new ones (Day, 1994). However, more recently, the conceptualisation of market orientation (Kohli and Jaworski, 1990; Narver and Slater, 1990; Oczkowski and Farrell, 1998) has received criticism in the literature (e.g., Narver et al., 2004) because its conceptualization was seen largely as responsive in nature (i.e., attempting to understand only customers' expressed needs and satisfying them). Such a responsive orientation to the market is that it makes firms risk averse, and therefore, subject to the 'tyranny of the served market' (Slater and Narver, 1995). Consequently, the firm is likely to ignore or place insufficient emphasis on new markets and/or potential competitors (Slater and Narver, 1995). Narver et al. (2000, p. 7) later advanced the concept of proactive market orientation (PMO) and defined it as "the attempt to understand and satisfy customers' latent needs". The development of PMO as a firm capability is based on Narver et al.'s (2004) argument that two types of customers needs exist: expressed and latent. Expressed needs are those needs of which customers are aware and consequently can express,

whereas latent needs are needs of which customers are unaware and which reside in the subconscious of the customers (Voola and O'Casey, 2010).

In this paper, it is argued that whilst the literature has alluded to the proactive nature of market orientation (e.g., Slater and Narver, 1995) a volume of work has focused on the firm's responsiveness to the market. In response to the growing call in the literature for including the proactive dimension in the conceptualisation of market orientation, we define MO as a firm-level intangible capability that allows firms to understand and satisfy customers' expressed and latent needs. This being the case, RMO and PMO in this study are conceptualised as two dimensions of MO, which is consistent with Narver et al. (2004) argument that RMO and PMO are in fact distinct, yet related, constructs.

Although there is evidence (e.g., Deshpande et al., 1993; Narver and Slater, 1990) of an association between RMO and business performance, RMO can be a source of competitive advantage only when it is rare in a firm's industry (Barney, 1991). With the widespread research on responsive market orientation and its relationship with firm performance, firms are increasingly investing in RMO. Consequently, as more companies develop RMO, competitors can, over time, imitate RMO. Therefore, firms must also understand the latent needs of customers in order to build barriers to imitation. MO is a capability that involves information generation and information use of information requiring complex interactions within firms. MO is likely to be a rare, valuable and inimitable capability and should consequently generate competitive advantage and improve firm performance as it involves processes and skills that make it difficult for competitors to imitate (Atuahene-Gima and Murray, 2004). Furthermore, several researchers have since found a positive link between market orientation and firm performance (Rapp et al., 2008; Zhou, Brown and Dev, 2009). Based on this rationale, as shown in Fig. 1, the following hypothesis is proposed:

**H1.** MO is positively related to firm performance.

#### 2.3.2. MO and e-business adoption

There is evidence that firm capabilities influence innovation adoption (Hult et al., 2004). There is also evidence that MO positively influences innovation adoption. For example, Narver et al. (2000) argue, and provide empirical evidence, for a positive relationship between innovation and both RMO and PMO. Given that the capability of MO is conceptualized in this paper as comprising responsive and proactive dimensions, it is argued that MO is related to innovation. This paper conceptualizes EBA as an innovation and we adopt Wu et al.'s (2003) conceptualization and define it as the use of internet technologies that link customers, suppliers, business partners and employees by adopting at least one of the following activities: (i) websites that offer sales transactions; (ii) customer service websites; (iii) intranets; (iv) extranets; and (v) IP electronic data interchange.

Prior studies have shown that customer orientation positively affects EBA. Importantly, Han et al. (1998) define customer orientation as the adoption of a continuous, proactive disposition toward meeting customers' needs, which is conceptually similar to PMO, which emphasizes proactiveness towards understanding customers; an important component of a firm's customer orientation is its ability to foresee the changes in the market and industry. Additionally, customer-oriented firms have a longer vision and better understand the latent needs of customers than do firms that are not customer-oriented. For example, customer-oriented firms are likely to communicate frequently with their customers in order to understand the needs of their customers and to provide superior value to their customers. Furthermore, such firms are willing to adopt innovations (e.g., online order-taking) that facilitate effective transactions with

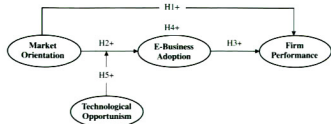


Fig. 1. Research model.

customers. On this basis, it is argued that MO leads to EBA because EBA allows the firm to fulfill the expressed and latent needs of its customers by facilitating efficient communication, and by improving internal processes (e.g., gathering market intelligence). Based on this rationale, the following hypothesis is proposed:

**H2.** MO is positively related to EBA.

### 2.3.3. E-business adoption and firm performance

Several studies (e.g., Hult et al., 2004) have reported a positive link between innovation adoption and performance. In the specific context of EBA, there is considerable evidence that EBA provides various strategic benefits (Wu, Zong and Mae, 2011). For instance, EBA reduces distribution costs, creates new markets (Geyskens et al., 2002), increases supply-chain efficiency and allows for closer customer relationships (Wu et al., 2003). There is also empirical evidence (e.g., Teo and Pian, 2003; Wu et al., 2003) that EBA is correlated positively to firm performance. For example, Teo and Pian (2003) found that EBA positively impacts competitive advantage, which is conceptualised as comprising differentiation, cost reduction, innovation, growth and the formation of alliances whereas, Wu et al. (2003) found a positive link between EBA and four measures of firm performance: efficiency, sales performance, customer satisfaction and relationship development. Furthermore, Rapp et al. (2008) found that e-business innovation influences customer relationship performance, and sales growth. Based on the preceding discussion, the following hypothesis is proposed (Fig. 1):

**H3.** EBA is positively related to firm performance.

### 2.3.4. Mediating effects of e-business adoption

In the IT and the Strategy literature, proponents of capability-technology integration (e.g., Bharadwaj, 2000; Clemons and Row, 1991; Lengnick-Hall, 1992; Powell and Dent-Micallef, 1997; Tippins and Sohi, 2003) apply the RBV to question the value of adopting technology without regard for firm capabilities. They argue that firm capabilities play a critical role in the relationship between technologically-based innovations and competitive advantage. Specifically, they suggest that the relationship between technology, such as e-business adoption, and firm performance depends on the technology being driven by the processes, systems and values that are embedded in capabilities such as market orientation. They argue that understanding the expressed and latent needs customers allows firms to adopt e-business technologies strategically (i.e., with a clear and planned purpose), which then results in competitive advantage. Furthermore, competitive advantage is aided by the causally ambiguous nature of the multiple relationships between MO, EBA and firm performance.

The marketing literature has demonstrated the importance of mediators such as innovation with respect to the capability-performance relationship (Foley, Fahy, 2009; Hult et al., 2004). For example, e-business has been argued by Wu et al. (2003) to mediate the effects of customer orientation on performance. In the broader context of market orientation, McNaughton et al. (2002) argue that mediating variables are key and cite market orientation as an example. Specifically, McNaughton et al. (2002, p. 993) argue that "the established logic is that a market orientation provides the basis for devising a strategy that creates value for customers, and that such a strategy provides the foundation for a sustainable competitive advantage".

Based on the prior discussion, it is arguably the case that capabilities such as MO create and shape a firm's EBA strategy, which, in turn, influences firm performance. This causal chain implies an indirect link between capabilities and firm performance in that

MO may improve firm performance partly because it increases EBA, which, in turn, increases firm performance. However, MO may improve performance via means that do not involve EBA. For instance, MO includes developing business objectives that are driven by customer satisfaction and loyalty, both of which may improve performance. Based on this rationale and shown in Fig. 1, it is expected that MO will have a direct effect on firm performance, as well as an indirect effect on firm performance via EBA. This reasoning leads to the following hypothesis:

**H4.** MO indirectly affects Firm Performance through EBA.

### 2.3.5. The complementarity effects of TO and MO on EBA

In this paper we define TO (i.e., a technological capability) as the processes that allow for actively sensing appropriate technologies and quickly responding to technological developments (Srinivasan et al., 2002; Sarkees 2011). TO and MO are conceptually similar as both can be classified as sensing and responding capabilities, however, they are substantially different. For example, the market orientation literature emphasizes sensing and responding to customers and competitors. However, several difficult sources (apart from customers and competitors) can act as a catalyst for new technologies (i.e., suppliers, other industries and universities). Furthermore, responding to the markets is essential as it provides clear benefits to the firm. However, responding to new technologies is risky as it is not clear if the new technology will yield positive outcomes for the firm (De Luca and Atuahene-Gima, 2007). Therefore, it is arguably the case that responding to the market is not necessarily synonymous with responding to new technologies (Srinivasan et al., 2002).

Although an individual capability (e.g., MO) can improve firm performance, competitors could quite easily imitate the capability and therefore remove any competitive advantage derived from the capability. Even firms with strategies based on a set of capabilities are susceptible to being imitated by competitors. However, it is more difficult to imitate a strategy that is based on capabilities that have complementary effects on a mediator of the capability-performance relationship. Complementarities between capabilities on a mediator are likely to increase the likelihood that a strategy is imperfectly imitable due to causal ambiguity and increased complexity (Dierickx and Cool, 1989). This paper argues that developing MO and TO simultaneously is important as they are distinct mechanisms through which firms can understand two related, but different, external environments (i.e., markets and new technologies) that can be complemented with each other to develop a more informed and holistic general strategy as well as a specific strategy for adopting innovations. This position is supported by empirical evidence (e.g., Song et al., 2005) showing that MO and TO complement each other.

Consequently, MO is more likely to lead to EBA in firms with high levels of TO than in firms with low levels of TO. This argument is based on the premise that firms with high levels of TO are not only more aware of technological developments, but are also more likely to take advantage of these developments because they are more likely to provide the resources necessary for adopting new technologies (Srinivasan et al., 2002; Sarkees 2011). Furthermore, firms with high levels of TO are more likely than firms with low levels of TO to both sense and respond to technological developments. Moreover, firms with high levels of TO are more likely than firms with low levels of TO to integrate technological developments with the expressed and latent needs of their customers, thereby increasing the effect of MO on EBA. Based on this rationale, and shown in Fig. 1, it is expected that the effects of MO on EBA will be stronger in firms with high levels of TO than in firms with low levels of TO. The following hypothesis is thus proposed:

**H5.** The positive effect of MO on EBA will increase as TO increases.

### 3. Methodology

#### 3.1. Sampling

Systematic sampling was applied due to its advantages of representativeness and ease of implementation. For example, every fourth firm (all were Australian firms) drawn from two Internet databases the databases in Australia (sample frame) was chosen as the sample unit. These include:

1. Australian Business Limited [[www.australianbusiness.com.au](http://www.australianbusiness.com.au)]
2. Australian Trade Commission [[www.austrade.gov.au](http://www.austrade.gov.au)]

The two databases list the firms with heterogeneous characteristics which were found ideal since the objective of the paper is to validate the research model (Fig. 1).

Since an important consideration in this research is the adoption of e-business, only firms with an operational website were selected. If a firm did not have a website (i.e., was under construction), the next firm on the list was chosen. The RBV does not place any significant emphasis on firm size as it is primarily focused on resource-based rather than monopoly-based advantages (Fahy, 2002). Therefore, the population of interest included all firms. For example, the industries represented included software, biotechnology, pharmaceuticals, engineering and mining. The mean year of e-business adoption was 1998.3. The majority of the firms were in the services industry (63.6%) and the remainder was in the manufacturing industry (36.4%).

As the firm-level variables in this paper are strategic in nature (i.e., firm capabilities and performance), executives or senior managers were deemed to be appropriate informants as the variables of interest attempt to understand processes with which they should be familiar (Venkataraman, 1989). CEOs or other top-level managers are important in obtaining information about the firm's strategic processes (Kumar et al., 1993) as they have the greatest insight into these firm practices (Child, 1997) and have the most influence on firm outcomes (Stubbart, 1989). Furthermore, past studies have demonstrated that knowledgeable senior managers can provide information as reliable and as valid as that obtained from multiple firm respondents (e.g., Atuahene-Gima and Murray, 2004).

#### 3.2. Data collection

In total, 1,400 firms were mailed the survey instrument. The survey assured respondents that individual responses would remain completely confidential and that only aggregate results would be reported. Of the firms contacted, 281 were returned due to incorrect addresses, 70 respondents e-mailed or telephoned to suggest that they were unable to complete the survey due to lack of time and the company policy did not permit completing a survey. As such, 206 surveys were returned with 189 provided full and complete data and deemed usable resulting in a response rate of 14.7%. This response rate is within the 10–20% range for top management survey response rates (Mennon et al., 1996). Additionally, the obtained response rate is comparable to studies investigating similar organizational phenomena. For example, where Hult et al. (2004) investigated adoption of innovation and obtained a response rate of 19% and, in the specific context of adoption of e-business, Wu et al. (2003) obtained a 14.1% response rate, whereas, Grewal et al. (2001) obtained a 14% response rate.

#### 3.3. Measures

All multi-item scales used within this research were developed and adopted from previous scales used in past survey research

studies. Scales for the constructs were obtained from the following sources: (i) market orientation – responsive and proactive – (Narver et al., 2004); (ii) technological opportunism – sensing and responding – (Srinivasan et al., 2002); (iii) e-business adoption – internal communication (EBAIntCom), external communication (EBAOutCom), inbound communication (EBAInBou), internal administration (EBAIntAdm), order-taking (EBAOrdTak), and procurement (EBAProc) – (Wu et al., 2003); and, (iv) organizational performance – market performance, financial performance; and customer-loyalty performance – (Hooley et al., 2005). Seven-point Likert scales were used for all of the measures.

#### 3.4. Profile of the sample

A descriptive analysis revealed that 47% of participants were managing directors, 24% were chief executive officers, 13% were owners and the remaining 16% of the respondents were general managers, partners or business development managers. Most of the respondents were male (85.6%) and the mean age of the respondents was 47.8 years. In order to verify respondents' knowledge of the adoption of e-business, each of the survey instruments contained a self-report item on the informant's knowledge of the area being studied (Kumar et al., 1993). The final sample showed a mean score of 5.36 (on a scale of 1–7, where 1 = not confident and 7 = very confident) about the accuracy of information provided about the firm's capabilities, e-business adoption and competitive advantage. This suggests that respondents perceived themselves to be knowledgeable about the information that they provided.

### 4. Results

To assess the possibility of non-response bias in the data, an extrapolation procedure recommended by Armstrong and Overton (1977) was conducted. Two analyses were performed based on the return dates of the surveys. Firstly, the first 75% of respondents were classified as early respondents whereas the remainder was classified as late respondents; late respondents were regarded as representative of non-respondents. A comparison of early responders and late responders revealed non-significant differences between the two groups in terms of EBA, MO, TO and Firm Performance. Secondly, to further examine the non-response bias, the very early respondents (first 25%) and the very late respondents, (last 25%) were examined. Similarly, the results suggest that there are no significant differences between the two groups in terms of EBA, MO, TO and Firm Performance, thus suggesting that non-response bias is not problematic.

#### 4.1. Model evaluation

Factor analyses were conducted to check the structure of the various scales. Due to the sample size, a separate analysis was conducted for the MO, TO, EBA and Firm Performance scales. The findings from these analyses are presented in Table 1. A cut-off value of 0.50 was used for the factor loadings based on Hair et al.'s (1998) recommendations.

As shown in Table 1, the final solutions revealed the following results: (i) MO – the responsive market orientation factor comprises nine items and the proactive market orientation factor comprises eight items; (ii) TO – the four technology-sensing items and the four technology-responding items form a single factor<sup>2</sup>;

<sup>2</sup> Although Srinivasan et al. (2002) conceptualize TO as comprising sensing and responding, they operationalise it as a one factor model, due to the difficulty in distinguishing between these dimensions (see Srinivasan et al., 2002). This operationalisation is valid as sensing and responding may occur simultaneously and therefore highly correlated.

**Table 1**  
Findings from the factor analyses.<sup>a</sup>

	Factor					
	1	2	3	4	5	6
<b>Market orientation</b>						
RMO1	.68					
RMO2	.74					
RMO3	.63					
RMO5	.75					
RMO6	.85					
RMO7	.62					
RMO8	.54					
RMO9	.64					
RMO10	.74					
PMO1		.70				
PMO2		.69				
PMO3		.76				
PMO4		.75				
PMO5		.66				
PMO6		.67				
PMO7		.67				
PMO8		.71				
<b>Technological opportunism</b>						
TOS1		.80				
TOS2		.84				
TOS3		.73				
TOS4		.68				
TOR1		.83				
TOR2		.81				
TOR3		.82				
TOR4		.75				
<b>E-business adoption</b>						
EBAIntCom1		.87				
EBAIntCom2		.93				
EBAIntCom3		.90				
EBAIntCom4		.81				
EBAOutCom2		.69				
EBAOutCom4		.85				
EBAOutCom5		.91				
EBAOutCom6		.83				
EBAInBoun2			.70			
EBAInBoun3			.85			
EBAInBoun4			.67			
EBAIntAdm1				.74		
EBAIntAdm2				.95		
EBAIntAdm3				.76		
EBAOrdTak1					.69	
EBAOrdTak3					.65	
EBAProc3						.61
EBAProc4						.89
<b>Performance</b>						
MarketPerf1	.77					
MarketPerf2	.77					
FinancePerf1		.85				
FinancePerf2		.83				
FinancePerf3		.73				
CustLoyalPerf1			.75			
CustLoyalPerf2			.86			
CustLoyalPerf3			.87			

<sup>a</sup> Loadings >.50 are shown.

EBA – the EBAIntCom factor comprises four items, the EBAOutCom factor comprises four items, the EBAInboun factor comprises three items, the EBAIntAdm factor comprises three items; the EBAOrdTak factor comprises two items, and the EBAProc factor comprises two items; (iii) Firm Performance – the market-performance factor comprises two items, the financial-performance factor comprises three items, and the factor for customer-loyalty performance comprises three items.

The internal reliability of the scales was examined using Cronbach's alpha ( $\alpha$ ) and the following results were obtained: (i) responsive market orientation ( $\alpha = .92$ ) and proactive market orientation ( $\alpha = .92$ ); (ii) TO ( $\alpha = .92$ ); (iii) EBAIntCom ( $\alpha = .93$ ), EBA-

**Table 2**  
Correlation matrix, means and standard deviations.

	Mean (s.d.)	1	2	3
1. MO	4.75 (1.19)			
2. TO	4.85 (1.31)	.74		
3. EBA	3.80 (1.32)	.56	.52	
4. Performance	4.67 (1.00)	.59	.59	.45

Note:  $p < .001$  for all correlation coefficients.

OutCom ( $\alpha = .90$ ), EBAInboun ( $\alpha = .79$ ), EBAIntAdm ( $\alpha = .85$ ), EBAOrdTak ( $\alpha = .69$ ), and EBAProc ( $\alpha = .71$ ); and (iv) market performance ( $\alpha = .92$ ), financial performance ( $\alpha = .91$ ), and customer-loyalty performance ( $\alpha = .93$ ). All of the scales thus have adequate internal reliability.

Scores for MO, TO, EBA and Firm Performance were created by calculating the average of the relevant items shown in Table 1. Table 2 provides the means, standard deviations and the correlations between the variables which show that all of the variables have significant positive correlations with each other. The large correlations between the variables bring into question the discriminant validity of the variables. Bagozzi and Warshaw (1990) suggested that discriminant validity between two constructs is demonstrated if the correlation coefficient is less than one minus two times the standard error of the correlation coefficient. The standard error of the correlation coefficient was calculated using the following formula:

$SE_c = \sqrt{1 - r^2/N - 2}$  Based on Bagozzi and Warshaw's (1990) suggestion, all of the variables have adequate discriminant validity.

#### 4.2. Hypotheses testing

The following findings are shown in Table 3: (i) MO has a significant positive correlation with performance – Hypothesis 1 is thus supported; (ii) MO has a significant positive correlation with EBA – Hypothesis 2 is thus supported; and (iii) EBA has a significant positive correlation with performance – Hypothesis 3 is thus supported.

Hypothesis 4 and Hypothesis 5 were tested using the moderated mediation procedure outlined by Muller et al. (2005). This procedure involves the use of three multiple regression analyses: (i) the dependent variable (i.e., firm performance) is regressed on the independent variable (i.e., MO), the moderator (i.e., TO) and their product-term (i.e., MOxTO); (ii) the mediator (i.e., EBA) is regressed on the independent variable, the moderator and their product-term; and (iii) the dependent variable is regressed on the independent variable, the moderator, their product term, the mediator, and the product-term of the mediator and the moderator (i.e., EBAXTO). The findings from these analyses are presented in Table 3.

All of the variables were standardised prior to conducting the multiple regression analyses, as recommended by (Aiken and West, 1991), in order to reduce the collinearity between the product-terms and their constituents. The following findings are shown in Table 3: (i) for the first regression, a non-significant interaction between MO and TO on firm performance whilst MO and TO have significant unique effects on firm performance; (ii) for the second regression, a significant interaction between MO and TO on EBA; and (iii) for the third regression, a non-significant interaction between MO and TO on firm performance, a non-significant interaction between EBA and TO on performance whilst MO, TO, and EBA all have significant unique effects on firm performance. It is worth noting that MO, TO and EBA have significant unique effects on firm performance despite being highly correlated with each other. The findings from the third regression indicate that that EBA partially mediates the effects of MO on firm performance.

The following findings shown in Table 3 are particularly relevant for the hypothesis: (i) MO and TO have an interaction effect

**Table 3**  
Least squares regression results for the moderated mediation analyses.

Predictors	Equation 1 (performance)		Equation 2 (EBA)		Equation 3 (performance)	
	b	t	b	t	b	t
MO	.335	3.83***	.560	4.86***	.266	2.87**
TO	.334	3.77***	.401	3.44***	.291	3.20**
MO × TO	-.024	-0.46	.200	2.92**	-.066	-0.97
EBA					.146	2.00*
EBA × TO					.036	0.43

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

on EBA, but not on firm performance; and (ii) EBA has a significant effect on firm performance in the presence of MO, TO, the interaction between MO and TO, and the interaction between EBA and TO. These findings indicate moderated mediation (Muller et al., 2005), and support Hypothesis 4 and Hypothesis 5.

To more closely examine the interaction between MO and TO on EBA, TO was split into three groups (i.e., Low TO, Medium TO and High TO) based on the 33rd percentile and the 67th percentile. For the Low TO group,  $n = 63$ ; for the Medium TO group,  $n = 65$ ; and for the high TO group,  $n = 61$ . A separate univariate regression was conducted for each of the groups using MO to predict EBA. The findings are as follows: (i) for the Low TO group,  $b = .245$ ,  $t = 2.42$ ,  $p < .05$ ; (ii) for the Medium TO group,  $b = .523$ ,  $t = 2.55$ ,  $p < .05$ ; and (iii) for the High TO group,  $b = .661$ ,  $t = 4.34$ ,  $p < .001$ . High TO group,  $b = .661$ ,  $t = 4.34$ ,  $p < .001$ . These findings support Hypothesis 4 as they reveal that the positive effect of MO on EBA increases as TO increases. Taken together, the findings reveal that the indirect effect of MO on performance via EBA depends on TO. Specifically, the indirect effect of MO on performance via EBA increases with increasing levels of TO.

## 5. Implications and limitations

### 5.1. Theoretical implications

There have been calls for the application of the RBV to marketing phenomena (Srivastava et al., 2001). The adoption of innovations is a cornerstone of marketing theory (Mohr and Shooshtari, 2003) and a core challenge for marketing practitioners (Hauser et al., 2006). This study applied the RBV to examine EBA. Furthermore, whilst the majority of studies have focused on deterministic pressures as antecedents to the adoption of innovations and thereby emphasize a reactive approach to strategy (Srinivasan et al., 2002), firm-specific capabilities were treated in this study as antecedents to the adoption of an innovation (i.e., EBA). Thereby, indicating a proactive approach to strategy (i.e., based on a firm's internal capabilities as opposed to being reactive to competitor moves).

Researchers all too often do not consider the interaction between firm capabilities, which is a significant oversight for two reasons. First, the interaction between firm capabilities is crucial because it can be regarded as an important source of causal ambiguity. Second, interactions are important as they affect issues of practice, theory and metatheory (Cronbach, 1987). Indeed, some scholars (e.g., Dutta et al., 1999) argue that the interaction of marketing and technological capabilities is the most important determinant of firm performance. There is evidence (e.g., Hult et al., 2004) that the effects of firm capabilities (e.g., market orientation and organizational learning) on firm performance are mediated by innovation. There is also evidence that firm capabilities (e.g., Song et al., 2005) have complementary effects on firm performance. However, the key premise of this paper, which was supported by

the findings, is that capabilities not only directly affect firm performance but also affect firm performance via their complementary effects on EBA, which is arguably a key mediator of the capabilities-performance relationship.

Given that the mechanisms of mediation and moderation (e.g., moderated mediation) arguably enhance the causal ambiguity of firm capabilities, this study examined the complementarity between a marketing capability (i.e., MO) and a technological capability (i.e., TO) on a mediator (i.e., EBA) of the capability-performance relationship. The main findings of this study were as follows: (i) EBA partially mediates the effects of MO and TO on performance in that MO and TO have significant direct effects on performance; and (ii) the effects of MO on EBA are moderated by TO. More precisely, the relationship between MO and EBA is stronger for high levels of TO than for Low levels of TO.

The findings show that the effects of MO on EBA are significant and positive for all three levels of TO thus revealing that MO is an important antecedent to EBA. However, the significant interaction between MO and TO indicates that the greater the extent to which TO is embedded in the organizational culture, the greater is its value as a facilitator of the MO-EBA relationship. Moreover, the complementarity between MO and TO provides one explanation as to why some firms are able to effectively adopt innovations, and thus improve firm performance by bundling multiple capabilities rather than emphasizing individual capabilities.

As shown in Table 3, TO not only moderates the MO-EBA relationship but also has unique positive effect on firm performance over and above those of MO and EBA. This finding is not surprising as TO is a firm capability, in that it possesses idiosyncratic processes that are complex which makes it difficult to be transferred across firms, and therefore, is a source of competitive advantage. Furthermore, the findings indicate that EBA and firm performance are enhanced when MO is complemented with MO. The complementarity of MO and TO makes it difficult for competitors to engage in undoing or in reverse engineering. As a result, TO enhances the effects of MO on both EBA and consequently firm performance by increasing causal ambiguity, thereby, rendering imitation more difficult.

There is a debate in the literature as to whether market orientation directly or indirectly affects firm performance (e.g., Cano et al., 2004; Langerak, 2003). The findings contribute to the market orientation literature by supporting both views in that MO was shown to have both direct and indirect effects (via EBA) on firm performance. Furthermore, the significant relationship between MO and firm performance further reinforce the notion that MO is a firm specific capability that enhances firm performance.

### 5.2. Managerial implications

There are three major implications of the findings for practitioners. First, the findings highlight the importance of an emphasis on the creation and development of an internal firm environment (i.e.,

firm capabilities) which supports and encourages the adoption of e-business technologies. Specifically, firms intending to adopt e-business technologies need to develop capabilities such as MO and TO beforehand because these firm capabilities drive EBA. Capabilities are the reflection of the evolutionary process of deliberate firm-specific investments, including investments of financial and managerial resources (Ethiraj et al., 2005). The development and maintenance of firm capabilities, such as MO and TO, requires considerable investments by the firm (Teecce et al., 1997) but is worthwhile because these capabilities improve firm performance both directly and indirectly through EBA. Furthermore, firms should invest in capabilities, such as MO and TO, which involve tacit knowledge and complex inter-relationships among requisite knowledge and skills because these facilitate causal ambiguity, and thus also facilitate sustainable competitive advantage (Reed and DeFillippi, 1990).

Second, managers need to carefully consider the type of capability-mix in order to increase the effects of the capabilities for the firm. The findings show that high levels of MO when combined with low levels of TO can prevent firms from realizing the full benefits of MO. The complementary nature of the MO and TO relationship suggests that managers should not only invest in multiple capabilities for the firm but should also carefully consider the level of investment for each capability. Furthermore, it is crucial for firms to develop processes that complement the information obtained from sensing and responding to customers (MO) with the information obtained from sensing and responding to technology (TO). This is because complementarity between these variables seems relevant to strategic decisions with regards to the adoption of e-business technologies.

The findings from this study, however, are relatively simple in that they advocate a “high-high” approach to MO and TO. Nevertheless, this study is in some ways a first cut at a can of worms (cf. Wernerfelt, 1984) and future research may reveal that some firm capabilities have, for example, cross-over interactions. We believe opportunities exist for future studies to examine this “high-high” approach in other contexts to aid generalizability relating to firm investments in different capabilities.

Third, the manner in which market orientation and e-business adoption are conceptualized has implications for practice. Whilst market orientation has traditionally been viewed as being responsive (i.e., understanding customer expressed needs), MO highlights the importance of understanding the latent needs of customers. This approach encourages organizations to adopt a holistic view of market orientation that includes proactively understanding the latent needs of customers. Additionally, e-business was conceptualised as comprising internal administration, order-taking, communication and procurement which differs from measuring e-business as a unitary construct (Srinivasan et al., 2002). This approach encourages organisations to view e-business as a complex and pervasive technology and thus avoids the limitations that are inherent in construing e-business as a unitary construct.

### 5.3. Limitations of the study

Some limitations of this study need to be mentioned. Firstly, the data for all of the variables were obtained via a common method from a single source and this method may bias the relationships between these variables. A single-factor test was conducted on all of the items to examine whether the majority of the covariance between the items could be attributed to common source/method variance. The results from this analysis revealed that the first factor accounted for 36.2% of the variance in the items thus indicating that common source/method variance does not explain the majority of the variance in the items.

Second, there are other firm capabilities that may affect the adoption of e-business. These include entrepreneurial orientation (Hult et al., 2004), technological orientation (Gatignon and Xuereb 1997), and organisational innovativeness (Deshpande et al., 1993). Therefore, future studies may include these firm capabilities in a model of innovation adoption. Third, it is arguably the case that the nature of the product (i.e., those product and services targeted at tech-savvy consumers) may render firms marketing these types of products naturally inclined to adopt e-business. Furthermore, some industries, particularly service oriented industries, such as the software industry, are dependent on e-business technologies. On the other hand, it is possible that e-business adoption is not necessarily beneficial in all circumstances for all firms such as in markets where consumers may not value, or are not aware of, e-business technologies, or cannot access e-business technologies.

Finally, this study does not analyze the differences in the nature of the product or the industry and under which specific industry/market circumstances e-business adoption is beneficial. Therefore, future studies can aim to understand the effects of product and industry characteristics on the adoption of e-business technologies as well as factors that influence the benefits of adopting e-business. Notwithstanding these limitations, this paper contributes to both market orientation and resource based view theories, specifically on the complementarity of firm capabilities and its effects on the adoption of innovation and firm performance.

## Appendix A. Survey items

Instructions: Please indicate to what extent you agree or disagree with the statements.

### A.1. Market orientation

#### A.1.1. Responsive market orientation

- 1: Our business objectives are driven by customer satisfaction.
- 2: We constantly monitor our level of commitment and orientation to serving customer needs.
- 3: We freely communicate information about our successful and unsuccessful customer experiences across all business functions.
- 4: Our strategy for competitive advantage is based on our understanding of customers' needs.
- 5: We measure customer satisfaction systematically and frequently.
- 6: We have routine or regular measures of customer service.
- 7: We are more customers focused than our competitors.
- 8: I believe this firm exists primarily to serve customers.
- 9: We poll end users at a least once a year to access the quality of our products and services.
- 10: Data on customer satisfaction are disseminated at all levels of the firm on a regular basis.

#### A.1.2. Proactive market orientation

- 1: We help our customers anticipate developments in their markets.
- 2: We continuously try to discover additional needs of our customers, needs which they maybe unaware of.
- 3: We incorporate solutions to unarticulated customer needs in our new products and services.
- 4: We brainstorm on how customers use our products and services.
- 5: We innovate even at the risk of making our own products obsolete.



6: We search for opportunities in areas where customers have a difficult time expressing their needs.

7: We work closely with lead users who try to recognize customers' needs months or even years before the majority of the market may recognize them.

8: We extrapolate key trends to gain insight into what users in a current market will need in the future.

## A.2. Technological opportunism

### A.2.1. Technology sensing

1: We are often one of the first in our industry to detect technological developments that may potentially affect our business.

2: We actively seek intelligence on technological changes in the environment that are likely to affect our business.

3: We are often slow to detect changes in technologies that might affect our business.

4: We periodically review the likely effect of changes in technology on our business.

### A.2.2. Technology responding

1: We generally respond very quickly to technological changes in the environment.

2: This business lags behind the industry in responding to new technologies.

3: For one reason or another, we are slow to respond to new technologies.

4: We tend to resist new technologies that cause our current investments to lose value.

## A.3. Electronic business adoption

Instructions: To what extent do each of the following statements characterize the extent of e-business adoption in your firm?

### A.3.1. Internal communication

1: Facilitate internal coordination between employees in different departments and different locations.

2: Regularly update employees about developments within the business.

3: Facilitate discussions and feedback on various issues of importance to our business.

4: Manage projects within the firm.

5: Coordinate new product development teams.

### A.3.2. Outbound Communication

1: Provide customers with general information about our business (e.g., via websites and information boards).

2: Allow customers to locate and send information to appropriate contacts within the business (e.g., via databases).

3: Send customers regular updates about new products and other developments within our business (e.g., via e-mail).

4: Provide solutions to customer problems (e.g., via web-based service solutions).

5: Provide after-sales service to our customers (e.g., via online information about installation and trouble shooting).

6: Provide information in response to customer questions or requests (e.g., via searchable online databases).

### A.3.3. Inbound communication

1: Send suppliers regular updates about new products plans and other new developments within our business (e.g., via e-mail).

2: Provide specific online information about product specifications that our suppliers must meet.

3: Share product and inventory planning information with our suppliers.

4: Permit suppliers to directly link up to our databases (e.g., via Enterprise Resource Planning/ERP systems).

### A.3.4. Internal administration

1: Perform financial and managerial accounting.

2: Provide reimbursements and manage payrolls.

3: Manage employee benefits (e.g., life and medical insurance).

### A.3.5. Order taking

1: Accept orders electronically from customers (e.g., online ordering).

2: Accept payments electronically from customers (online payment).

3: Allow customers to track and inquire about their orders electronically.

### A.3.6. Procurement

1: Search and locate potential suppliers online.

2: Place and track orders with suppliers electronically (e.g., online order) placements.

3: Allow suppliers to submit bids online.

4: Use online marketplaces to source suppliers.

## A.4. Firm performance

Instructions: To what extent has your firm gained the following advantages over competitors?

### A.4.1. Market performance

1: Sales volume achieved compared to competitors.

2: Market share compared to competitors.

### A.4.2. Financial performance

1: Overall profit levels achieved compared to competitors.

2: Profit margins compared to competitors.

3: Return on investment compared to competitors.

### A.4.3. Customer loyalty performance

1: Levels of customer loyalty compared to competitors.

2: Levels of customer satisfaction compared to last year.

3: Levels of customer loyalty compared to last year..

\*Item deleted after the factor analysis.

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