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# Examining the role of information technology in cultivating firms' dynamic marketing capabilities

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ABSTRACT

Most prior research has investigated an organization's dynamic capabilities in general and overlooked their effect on critical business functions. Our study considered the role of IT in improving firm's dynamic marketing capabilities. We developed a model consisting of market orientation, IT infrastructure capabilities, and the use of IT in customer relationship management (CRM). With data collected from 135 manufacturing and service firms in Taiwan, our results supported most of our hypotheses. Our results showed important direct effects of a firm's market orientation, use of IT to support CRM, and the functionality of IT infrastructure capabilities on its dynamic marketing capabilities.



## 1. Introduction

Business researchers have coined the term dynamic capabilities (DC) to capture the firm's ability to adapt to unpredictable, changing environments. They allow the firm to reconfigure its resources and respond to market changes effectively while responding to changing environments [10]. Considerable previous research has examined the key mechanisms or processes that contribute to a firm's DC [23].

The concept of DC is broad and involves different business aspects and processes [18]. Although IT literature provides some interesting strategic insights, few studies have analyzed DC specific to a business area. Firms vary in their relative strengths in business operations and may choose to focus on particular functional areas; it is therefore important to investigate DC at a finer-grained level, especially with respect to fundamental business aspects in which firms must cultivate DC [6]. Marketing is a critical area in which firms must develop DC. Thus marketing constitutes a crucial dimension in which analysts should assess a firm's capabilities in order to satisfy customers' needs, wants, and preferences [13].

In the evolving marketplace, dynamic marketing capabilities (DMC) allow firms to identify important market signals, evaluate new processes or services, and design and execute effective responses to market change. They refer to a set of processes that a firm needs to be able to use while responding to market change. They directly influence a firm's product development, innovative service design, and long-term customer relationships, which jointly define its competitiveness [3]. We examined a firms' DMC by focusing on the important marketing processes and activities, particularly those related to CRM.

DMC, IT has been recognized as a major enabler of DMC by creating an arena in which competitive advantage can be exploited through process improvement, service excellence, and customer intimacy [16]. IT infrastructure capabilities and IT support of specific business aspects are crucial and deserve attention.

We developed a parsimonious model that relates a firm's DMC with its market orientation, IT infrastructure capabilities, and IT support for CRM. We empirically tested this model and its associated hypotheses with data collected from a survey of major Taiwanese manufacturing and service firms.

## 2. Literature review and theoretical foundation

In the area of competitive advantages analysis, the resource-based view (RBV) has been used as a theoretical lens to explore the contributions of IT to firm performance [5,21]; it provides a framework for understanding how firms gain sustainable

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competitive advantage, assuming that resources are distributed heterogeneously across the firm and that this distribution remains relatively stable over time. These assumptions, of course, make the RBV less applicable in highly volatile environments. Some researchers therefore shift their focus to DC [22]. Then, the firm must decide how to build, integrate, and reconfigure their limited resources and relative strengths to respond to key market change or new technology.

A firm's DC are difficult to replicate [7], even when competitors can observe or infer their trend from the firm's behavior and performance. In industries characterized by continuous technology advancement, the success or failure of firms depends on how effectively they can deploy an appropriate technology and assimilate it within the business. Thus DC allows a firm to extend its operations beyond routine production and service delivery, thereby improving its performance.

The relationship between marketing and dynamic orientation has been studied in the context of the product life cycle and market development [11]. These aspects also relate to an organization's agility, which is the firm's ability to detect and seize market opportunities rapidly [18]. DMC encompass a firm's capabilities in product development or service design, pricing, channel design, and promotion [22], which together define its marketing mix.

Equipped with DMC, firms can adjust their marketing processes and activities to increase sales, better serve customers, cultivate favorable long-term customer intimacy, or quickly respond to changing conditions [20]. We built on the theoretical foundation of the capability-building process to analyze key factors for cultivating a firm's DMC.

IT competence affects the organizational base of IT resources, with IT infrastructure being a typical, important elements of its competence. Thus, firms with a high level of digital options are better at utilizing IT.

A firm's IT infrastructure capabilities are the IT resources that support its processes, whereas IT support for CRM shows the extent to which the firm utilizes technology to achieve its market position. By considering market orientation, we can better understand firms' strategies for developing competitive advantages in general and DMC in particular.

### 2.1. IT infrastructure capabilities

The IT infrastructure can allow a firm to exploit the benefits of technology through process improvement and operational excellence. It offers firms the flexibility necessary to cope with uncertainty about future IS needs [15]. It embraces both connectivity and functionality, which is more stable than business operations or the applications it supports [4]; it also extends or restricts a firm's ability to add, modify, and remove business applications, with few adverse effects on existing applications.

### 2.2. IT support for CRM

Firms constantly seek opportunities to solve their business problems and respond to market changes better and faster [9]. By collecting and analyzing customer demographic and behavioral data, firms improve their communications with customers, enhance marketing strategies and activities, choose appropriate distribution channels, and provide effective customer support and services. Effective CRM allows firms to identify valuable customers, obtain and accumulate crucial knowledge about them, and create greater customer value [17], but it requires seamless integration of the business functions and operations, and its effectiveness depends on the firm's ability to gather and integrate data about customers and their behavior, perform detailed processing and analyses of the data, and propagate this information and knowledge throughout the organization. Through IT, firms can improve their customer intimacy, anticipate and stay abreast of market changes, cut costs, increase sales, and foster customer satisfaction and loyalty.

### 2.3. Market orientation

Modern firms need to generate market intelligence about current and future customer needs and disseminate it to departments and business units to ensure, timely response to market change. Highly market-oriented firms constantly strive for customer value creation and performance improvement. They also monitor market conditions, perform market trend analyses, and gain a thorough understanding of customer needs and competitor strategies; this also aids in promoting organizational learning and innovation [12].

## 3. Research model and hypotheses

We developed a model in which market orientation, IT infrastructure capabilities, and IT support for CRM were considered to be critical factors in explaining a firm's DMC. Our model distinguishes the connectivity and functionality of the firm's IT infrastructure capabilities, because they serve distinct purposes. It also emphasizes the central role of IT in its support for CRM, as well as the infrastructural capabilities of network connections and data transmissions, and the kernel services necessary for data processing and information sharing throughout the organization. Fig. 1 shows the research model.

A firm's market orientation dictates how it can adapt to the business environment [12] and move toward a winning position by leveraging the technology, resources, and its relationship with suppliers and customers. A firm's market orientation should be that of a culture that values new information in the marketplace. The effectiveness of CRM demands substantial capabilities for collecting, integrating, and analyzing large volumes of customer data. Strategic insights generated from market orientation are vital for firms to anticipate opportunities. Thus, a highly market-oriented firm tends to seize any opportunity to create good CRM applications via IT resources. Accordingly, we propose a hypothesis:

**H1.** A firm's market orientation is positively associated with its IT support for CRM.

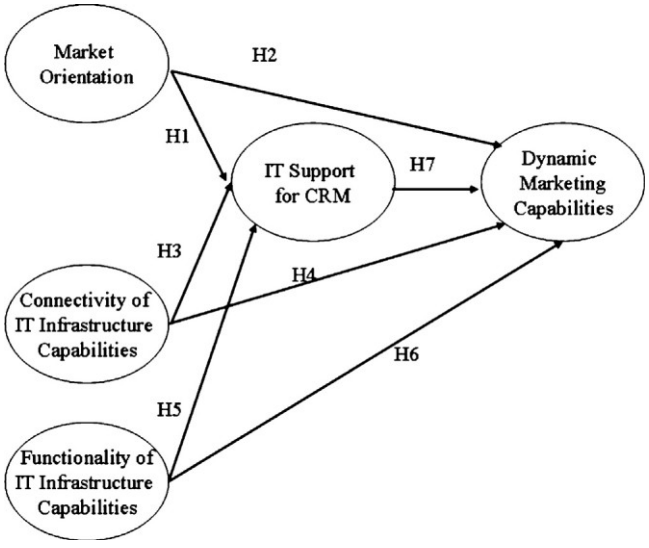


**Fig. 1.** Our research model.

Highly market-oriented firms also have a greater need for market intelligence, implying a positive influence of market orientation on DMC. According to DC theory, the marketing processes that a firm uses to respond to environmental change are shaped by its targeted market position and affected by its market orientation. A market-oriented firm must understand changing market conditions and stay atop of emerging trends by scanning key market events to detect unexpected changes, allowing it to quickly generate and execute effective responses. Empirical evidence has suggested that market orientation influences the firm's performance and product (service) market performance, thus we proposed:

**H2.** A firm's market orientation is positively associated with its DMC.

Connectivity allows different applications to run simultaneously across geographically dispersed locations. High connectivity provides a basis for simultaneous, complex application processing to often involving functional departments and supply chains. The connectivity establishes an enterprise-wide network for connecting various IS and computer-based CRM, which can provide information to groups involved in CRM. Firms with greater connectivity capabilities in their IT infrastructure stay closer to customers and partners. Thus, we hypothesized:

**H3.** The connectivity of a firm's IT infrastructure capabilities is positively associated with its IT support for CRM.

Through network communications and data transmission, connectivity enables firms to achieve cycle time compression and agile market response. A firm's DC rely heavily on the processes that offer coordination and integration, learning and reconfiguration. Those processes can be improved by an IT infrastructure that offers the firm greater connectivity. The firm's DMC therefore should increase, as shown by successful reengineering, agile product development, and effective promotion design. Accordingly, we proposed:

**H4.** The connectivity of a firm's IT infrastructure capabilities is positively associated with its DMC.

For many firms, the core value of IT has shifted from general data/information processing to value creation applications. When a firm's IT infrastructure offers a greater functionality, the firm should be able to develop new applications in support of its CRM with greater integration, sophisticated processing, and advanced analyses. Thus, we hypothesized:

**H5.** The functionality of a firm's IT infrastructure capabilities is positively associated with its IT support for CRM.

Firms also depend on their IT infrastructure's functionality to respond to market change. This can enable or support a more comprehensive range of kernel services that provide the foundation necessary for adjusting operations, changing processes, and reconfiguring marketing resources. Furthermore, functionality can improve data processing and information flows in the organization, leading to improved business analyses and better decision making. Studies have shown that firms can create DC by reducing the costs of information or enhancing the development, deployment, and use of intangible assets. Such efforts can foster the creation and augmentation of DMC for adapting to essential market changes or seizing valuable new business opportunities. We thus proposed:

**H6.** The functionality of a firm's IT infrastructure capabilities is positively associated with its DMC.

Finally, by using IT to support CRM, firms can optimize their sales processes, improve customer service designs, combine related and often disintegrated data about customers and the market, enhance service quality, facilitate customer communications, profile valuable customers, and support effective marketing campaigns With these capabilities, firms become more effective in forecasting market demands, providing customization, and adapting to market changes. We therefore hypothesized:

**H7.** A firm's use of IT to support CRM is positively associated with its DMC.

## 4. Study design and data collection

Our survey targeted major manufacturing and service firms in Taiwan. They were selected from the top 1000 manufacturers and top 500 service firms among the Largest Corporations in Taiwan as published in a special issue by Common Wealth. We sent survey packets to the chief marketing officer of each firm. Our survey packet consisted of a cover letter that described our study and its purpose, the questionnaire, and a self-addressed stamped return envelope. To encourage greater participation, we promised firms that we would make, on each respondent's behalf, a donation of 50 New Taiwan dollars (i.e., approximately US$1.5) to a nonprofit charity organization.[1]

### 4.1. Measurements

We operationalized market orientation, IT support for CRM, and DMC with nine items, six items and 12 items respectively, using a five-point Likert scale, from 1 as *strongly disagree* to 5 as *strongly agree*. To measure IT infrastructure capabilities, we used the previously developed scale which included both connectivity and functionality. The details of the survey items of our study are listed in Appendix A.

### 4.2. Pretest

The questionnaire was administered in Chinese, the official language in Taiwan. Adapted items were translated into Chinese by experienced translators, and then two researchers fluent in both English and Chinese reviewed the translation to ensure consistent semantics of the question items between languages. After resolving some minor wording discrepancies, we conducted a pretest to assess the reliability and validity of the instrument. The results were satisfactory; several minor wording changes made the question items more appropriate to the targeted context and subjects.

### 4.3. Data collection

We sent the survey packets, by traditional mail, to a sample of 500 firms randomly selected from our target pool of firms. Each firm was asked to respond with the filled-in survey within three weeks; at the end of this, we sent a reminder letter allowing non-responders an additional two weeks to respond.

## 5. Analyses and results

Of the 149 surveys we received, 14 incomplete ones were removed from subsequent analyses. Thus, the effective response rate was 13.9%. As shown in Table 1, the responding firms spanned a wide range of industries; most were manufacturing firms (63%),

[1] The beneficiary charity organization was *World Vision Taiwan*, whose purpose is to assist underprivileged communities to overcome poverty and social injustice.

**Table 1**
Demographic characteristics of participating firms ($n = 135$).

| Characteristics | Number of firms | Percentage of firms |
|---|---|---|
| Industry category | | |
| Manufacturing | | |
| Electronics | 19 | 14.1 |
| Computer and communications | 17 | 12.6 |
| Non-metallic product | 17 | 12.6 |
| Metal and machinery | 11 | 8.1 |
| Motor vehicles and parts | 9 | 6.7 |
| Others | 12 | 8.9 |
| Service | | |
| Transportation and logistic | 11 | 8.1 |
| Information and communication service | 8 | 5.9 |
| Construction and engineering | 8 | 5.9 |
| Trade, wholesale and retail | 7 | 5.2 |
| Automobiles sales and repair | 4 | 3.0 |
| Others | 12 | 8.9 |
| Total assets (in US dollar) | | |
| ≤15 million | 40 | 29.6 |
| 15–60 million | 48 | 35.6 |
| 6–150 million | 26 | 19.3 |
| More than 150 million | 21 | 15.6 |
| Number of full-time employees | | |
| ≤100 | 12 | 8.9 |
| 101–300 | 34 | 25.2 |
| 301–500 | 23 | 17.0 |
| 501–1000 | 26 | 19.3 |
| More than 1000 | 40 | 29.6 |
| Number of full-time IT employees | | |
| <2 | 23 | 17.0 |
| 3–5 | 29 | 21.5 |
| 6–10 | 36 | 26.7 |
| 11–20 | 20 | 14.8 |
| 21–50 | 15 | 11.1 |
| More than 51 | 9 | 6.7 |
| Missing value | 3 | 2.2 |

mostly in the electronics (14%), computers and communications (12.6%), and non-metallic production (13%) sectors. Our sample firms varies in total assets and number of full-time employees; approximately 35% of them owned total assets greater than US$60 million, and on average, they employed about 500 full-time employees. The responses from different industries were in proportion to the wider sample of industries included in our mailing; the responding firms were representative of our target in terms of industry and firm size.

We tested our model and hypotheses using PLS. Although covariance-based SEM approaches, such as LISREL, are widely used in empirical testing of causal models, they have general constraints for studies that have a small sample, formative indicators, a large number of indicators, or some combination thereof. PLS, a component-based SEM approach, can mitigate the constraints common to covariance-based SEM approaches and offer robustness in causal model testing and desirable predictive power. In our case, PLS provides several advantages: accommodating different scale types, estimating the linkages between measures and constructs as well as between different constructs simultaneously, and allowing for constructs measured by a large number of indicators.

**Table 2**
Summary of factor loadings.

| Factors | Items | Loading | *t*-Statistic |
|---|---|---|---|
| Market orientation | MO_GEN02 | 0.63 | 10.8 |
| | MO_GEN03 | 0.58 | 7.4 |
| | MO_GEN05 | 0.72 | 15.3 |
| | MO_DIS03 | 0.72 | 14.3 |
| | MO_DIS04 | 0.74 | 17.5 |
| | MO_DIS05 | 0.65 | 10.5 |
| | MO_REP03 | 0.78 | 23.9 |
| | MO_REP04 | 0.80 | 26.1 |
| | MO_REP08 | 0.81 | 29.5 |
| IT support for CRM | CRM01 | 0.84 | 36.7 |
| | CRM02 | 0.87 | 40.7 |
| | CRM03 | 0.83 | 31.2 |
| | CRM04 | 0.83 | 27.1 |
| | CRM05 | 0.83 | 27.5 |
| | CRM06 | 0.82 | 28.3 |
| DMC | DM_PRO01 | 0.70 | 11.7 |
| | DM_PRO02 | 0.80 | 22.8 |
| | DM_PRO03 | 0.79 | 25.3 |
| | DM_PRI01 | 0.77 | 18.6 |
| | DM_PRI02 | 0.83 | 28.8 |
| | DM_PRI03 | 0.85 | 31.8 |
| | DM_PLA01 | 0.82 | 25.1 |
| | DM_PLA02 | 0.85 | 35.4 |
| | DM_PLA03 | 0.86 | 34.8 |
| | DM_PMO01 | 0.79 | 19.2 |
| | DM_PMO02 | 0.80 | 19.3 |
| | DM_PMO03 | 0.79 | 21.5 |

### 5.1. Instrument reexamination

Researchers have different views about the nature or model specification of market orientation as a construct. Both formative and reflective models aligned reasonably well with theoretical predictions [2]. Some researchers have suggested that the main scales for measuring market orientation should be as a set of activities that signal the market orientation, and thus to use a formative model. But market orientation is also a salient aspect of an organization's culture that requires intelligence collection and dissemination and this suggests a reflective specification.

The original MARKOR scale was designed and specified as a reflective construct. Because we adapted our measurement items from the original MARKOR scale, we selected this reflective view and then examined the items according to the commonly accepted criteria for reflective measures [8,14]. These criteria include whether the items define the construct; whether change in measures influence the construct or if a change to the construct would influence all its items; whether the measurement items were interchangeable; whether the measures covaried and whether the measures had the same antecedents and consequences. In light of conceptualizations of market orientation using cultural (or behavioral) bases, we posited that its operationalization should emphasize the underlying customer value system shared among employees as an important source of competitive advantage. Accordingly, we measured this construct reflectively. We measured market orientation as the firm-wide emphasis on market intelligence and internal coordination across departments or units. Arguably, our items captured the firm's business culture, measured as a reflective construct. Market orientation also reflects

**Table 3**
Analysis of reliabilities and variance extracted.

| | Composite reliability | Cronbach's alpha | Variance extracted |
|---|---|---|---|
| 1. Market orientation | 0.91 | 0.88 | 0.52 |
| 2. IT support for CRM | 0.93 | 0.91 | 0.70 |
| 3. Dynamic marketing capability | 0.96 | 0.95 | 0.65 |

the firm's culture, so changes in this latent construct could lead to changes in the measurement items that reveal the firm's business practices. Adding or removing a measurement item would not alter the conceptualization of the focal construct. Each item is moderately or highly correlated with other items measuring the same construct, as shown by correlation coefficients ranging from 0.46 to 0.63. In addition, our measurement items showed unidimensionality and internal consistency. We also assessed convergent and discriminant validity; the measurement items exhibited the same relationships with antecedents. Finally, according to our model, the items should exert comparable impacts on DMC and IT support for CRM, as posited in H1 and H2. In contrast, if we tested the model by specifying market orientation as a formative construct and employing a bootstrap procedure, the results offer weak indicator validity; that is, most of the outer weights of items become statistically insignificant. Thus, our construct reexaminations suggest that our constructs were reflective rather than formative.

We examined our instrument in terms of reliability and convergent and discriminant validity. To assess item reliability, we analyzed the loading of each item on its corresponding construct [19]. Items with a loading greater than 0.7 are generally reliable; those with a loading lower than 0.5 should be considered for removal. All loadings for items exceeded this suggested cutoff threshold. The loadings of all the remaining items were statistically significant at the 0.01 level, as shown in Table 2.

We analyzed our instrument's construct reliability in terms of internal consistency and composite construct reliability. We computed Cronbach's alpha to assess internal consistency and adopted a threshold of 0.7. All investigated constructs had a Cronbach's alpha value greater than 0.7. As summarized in Table 3, the composite reliability of each construct exceeded 0.7, a common threshold for signifying satisfactory construct reliability [1]. Thus the instrument's construct reliability seems to be satisfactory.

We next examined convergent validity using the average variance extracted (AVE), which denotes the variance captured by indicators. In general, an AVE exceeding 0.5 suggests adequate convergent validity. Each investigated construct had an AVE greater than 0.6, indicating that our instrument exhibited adequate convergent validity. We further analyzed convergent and discriminant validity by examining the cross-loadings computed from the correlation between each construct's component score and the indicators of other constructs. As shown in Table 4, all items loaded substantially higher on their own construct than on others. The square roots of the AVEs were also greater than the correlation among any pair of latent constructs. Together, these results suggest that the instrument exhibits appropriate convergent and discriminant validity (see Table 5).

### 5.2. Model and hypothesis testing

We used a bootstrap resampling procedure with resamples of 250 for the PLS analysis. We tested our model by examining the $R^2$ value of each endogenous variable. As we show in Fig. 2, our model was able to explain a significant portion of the variance in DMC ($R^2$ = 63%) and IT support for CRM ($R^2$ = 42%). We tested each hypothesis by assessing the statistical significance and magnitude of its corresponding path in the model. According to our results, market orientation showed a significant, direct effect on IT support for CRM (path coefficient = 0.53, $p < 0.01$). Moreover, IT support for CRM appeared to be influenced by the connectivity of IT infrastructure capabilities (path coefficient = 0.21, $p < 0.01$) but was not significantly affected by the functionality. Thus, our data supported H1 and H3 but not H5. In addition, market orientation exhibited a significant influence on DMC (path coefficient = 0.44, $p < 0.01$), as did IT support for CRM (path coefficient = 0.38, $p < 0.01$), supporting H2 and H7. Finally, the effect of the functionality of IT infrastructure capabilities on DMC was significant (path coefficient = 0.10, $p < 0.01$), but connectivity was not; thus, our data supported H6 but not H4. Table 6 summarizes our hypothesis testing results.

**Table 4**
Summary of cross-factor loadings.

| | Market orientation | IT support for CRM | Dynamic marketing capability |
|---|---|---|---|
| MO_GEN02 | 0.63 | 0.38 | 0.45 |
| MO_GEN03 | 0.58 | 0.28 | 0.41 |
| MO_GEN05 | 0.73 | 0.36 | 0.49 |
| MO_DIS03 | 0.73 | 0.39 | 0.51 |
| MO_DIS04 | 0.75 | 0.43 | 0.50 |
| MO_DIS05 | 0.66 | 0.39 | 0.49 |
| MO_REP03 | 0.78 | 0.49 | 0.61 |
| MO_REP04 | 0.80 | 0.59 | 0.55 |
| MO_REP08 | 0.81 | 0.46 | 0.56 |
| CRM01 | 0.51 | 0.84 | 0.61 |
| CRM02 | 0.52 | 0.87 | 0.62 |
| CRM03 | 0.43 | 0.83 | 0.62 |
| CRM04 | 0.49 | 0.83 | 0.60 |
| CRM05 | 0.49 | 0.83 | 0.51 |
| CRM06 | 0.54 | 0.82 | 0.52 |
| DM_PRO01 | 0.61 | 0.51 | 0.70 |
| DM_PRO02 | 0.64 | 0.62 | 0.80 |
| DM_PRO03 | 0.64 | 0.57 | 0.79 |
| DM_PRI01 | 0.56 | 0.54 | 0.77 |
| DM_PRI02 | 0.57 | 0.54 | 0.83 |
| DM_PRI03 | 0.61 | 0.53 | 0.86 |
| DM_PLA01 | 0.51 | 0.57 | 0.82 |
| DM_PLA02 | 0.55 | 0.57 | 0.85 |
| DM_PLA03 | 0.55 | 0.55 | 0.86 |
| DM_PRO01 | 0.50 | 0.58 | 0.79 |
| DM_PRO02 | 0.52 | 0.57 | 0.80 |
| DM_PRO03 | 0.56 | 0.55 | 0.79 |

### 5.3. Mediating role of IT support for CRM

IT support for CRM affected DMC and was influenced by both market orientation and connectivity of IT infrastructure capabilities. We further investigated the mediating role of IT support for CRM to determine partial versus full mediation. In our post hoc analysis, we advocated the critical integrative role of CRM technology in coordinating the firm's marketing processes and technologies. To test this mediating effect, we used three regression models and followed Sobel's procedure; this allowed us to examine whether the relationship between market orientation and DMC was either considerably reduced (partial mediation) or completely diminished (full mediation) when we incorporated IT support for CRM into the model as an additional predictor of DMC. As Table 7 shows, IT support for CRM appeared to partially mediate the influence of market orientation on DMC, as suggested by the significant, direct relationship between market orientation and DMC. The influence of market orientation on DMC ($\beta$ coefficient = 0.81, $p < 0.01$) decreased noticeably when we incorporated the path through IT support for CRM ($\beta$ coefficient = 0.52, $p < 0.01$). The Sobel test result was also

**Table 5**
Latent variable correlations.

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1. Market orientation | 1.00 | | | | |
| 2. Connectivity-IT infrastructure | 0.20 | 1.00 | | | |
| 3. Functionality-IT infrastructure | 0.21 | 0.42 | 1.00 | | |
| 4. IT support for CRM | 0.59 | 0.36 | 0.29 | 1.00 | |
| 5. DMC | 0.71 | 0.31 | 0.33 | 0.69 | 1.00 |

**Table 6**
Summary of hypothesis testing results.

| Hypothesis | Result |
|---|---|
| 1: A firm's market orientation is positively associated with its use of IT to support CRM | Support |
| 2: A firm's market orientation is positively associated with its DMC | Support |
| 3: The connectivity of a firm's IT infrastructure capabilities is positively associated with its use of IT to support CRM | Support |
| 4: The connectivity of a firm's IT infrastructure capabilities is positively associated with its DMC | No support |
| 5: The functionality of a firm's IT infrastructure capabilities is positively associated with its use of IT to support CRM | No support |
| 6: The functionality of a firm's IT infrastructure capabilities is positively associated with its DMC | Support |
| 7: A firm's use of IT to support CRM is positively associated with its DMC | Support |

**Table 7**
Summary of regression results on mediation effect testing.

| | Dependent variables | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | DMC | | CRM | | DMC | | DMC | |
| | $\beta$ | SE | $\beta$ | SE | $\beta$ | SE | $\beta$ | SE |
| Independent variables | | | | | | | | |
| MO | | | 0.59 (8.34) | 0.07 | 0.69 (11.08) | 0.06 | 0.44 (6.48) | 0.07 |
| CRM | 0.69 (11.04) | 0.06 | | | | | 0.44 (6.43) | 0.07 |
| $R^2$ | 0.48 | | 0.34 | | 0.48 | | 0.60 | |
| Adjusted $R^2$ | 0.47 | | 0.34 | | 0.48 | | 0.60 | |
| Dependent variables | | | | | | | | |
| C-ITIC | | | 0.36 (4.46) | 0.08 | 0.31 (3.69) | 0.08 | 0.06 (0.95) | 0.07 |
| CRM | 0.68 (11.04) | 0.06 | | | | | 0.67 (9.95) | 0.07 |
| $R^2$ | 0.48 | | 0.13 | | 0.09 | | 0.48 | |
| Adjusted $R^2$ | 0.47 | | 0.12 | | 0.09 | | 0.47 | |

*Notes*: MO, market orientation; CRM, IT support for CRM; DMC, DMC; C-ITIC, connectivity of IT infrastructure capabilities; CRM, IT support for CRM; DMC, DMC.

significant (6.80, $p < 0.001$), suggesting that the between-models difference was statistically significant. Furthermore, IT support for CRM fully mediated the influence of connectivity of IT infrastructure capabilities on DMC. The effect of connectivity on DMC ($\beta$ coefficient = 0.31, $p < 0.01$) became insignificant when we incorporated the path through IT support for CRM. The Sobel test result was also significant (4.18, $p < 0.001$), suggesting statistical significance of the between-models difference.

The mediating effect of IT support for CRM that we observed was congruent with the model testing results, indicating that market orientation affected DMC both directly and indirectly and that the connectivity of IT infrastructure capabilities influenced DMC only indirectly. This suggested that there were indirect, important paths by which market orientation and connectivity foster the firm's DMC.

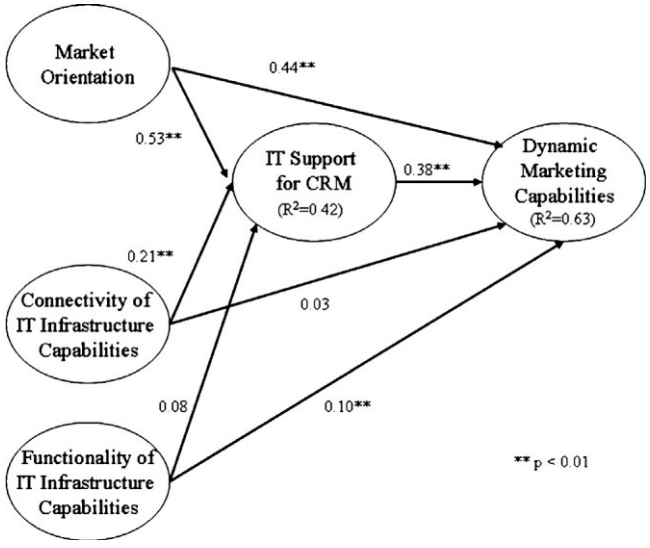


**Fig. 2.** Our model and hypothesis testing results.

## 6. Discussion and implications

Overall, our findings reveal the central role of IT in supporting CRM by mediating the influences of important antecedents of the firm's DMC. Firms must recognize the use of IT to support their CRM and leverage the effects of market orientation in creating and augmenting DMC.

Our study contributes to information systems in several ways. First, our results underscore the importance of IT in supporting critical business processes and activities, and thereby enhancing DMC. Our approach is congruent with a conceptualization of the capability-building process. We therefore attain a better theoretical understanding of the process that creates a specific source of competitive advantage. Second, our results highlight the need to recognize different aspects of IT infrastructure capabilities to gain more comprehensive insights into the value of IT infrastructure. Most previous studies consider IT infrastructure capabilities as a single-dimensional construct, but IT infrastructure capabilities involve different resources that vary in key characteristics, which may help explain the dissimilar findings reported by prior studies. Third, our approach and results expand the boundaries of dynamic capabilities theory in that we operationalize key constructs related to marketing and possibly other business contexts. This contribution represents a point of departure for continued investigations of DC at finer-grained levels, specific to critical business functions.

## 7. Conclusion

DC offer a logical anchor for competitive advantage analysis. We studied DMC in firms by focusing on the central role of IT in supporting CRM and found empirical support for most of our hypotheses. Overall, our model offered appropriate utilities for

explaining the DMC of the firm and the effects of IT in creating such capabilities.

However, our study also had several limitations. First, our results derive from a single study involving a sample of voluntarily participating firms. We did not find evidence suggesting that these firms had specific characteristics correlated with the variables we examined. To respond to the questions in our survey, the informants did not need specialized knowledge or experience with a particular system. Overall, the respondents thus had no explicit, direct motives to self-select into our study. However, we cannot completely rule out such bias. Therefore, our findings should be generalized only cautiously. Second, measuring IT infrastructure capabilities and DMC is challenging. The measures we use were reasonable, but further conceptual development and empirical examination are needed. Third, the proposed model can explain a significant portion of the variance in DMC and IT support for CRM; but there may be other exogenous variables.

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## Appendix A. Question items included in the study

We operationalized market orientation with nine items.[2] These items assessed market intelligence generation, information dissemination, and firm responsiveness. To measure IT infrastructure capabilities, we used the previously developed scale of Piccoli and Ives[3] which included both connectivity, and functionality. We used six items to measure IT support for CRM. To measure dynamic marketing capability, we used material from a handbook[4] and also extended the DC analysis of Teece,[5] to emphasize the essential dimensions of the marketing mix (product (or service) development, pricing, channel design (place), and promotion) by adding three important roles of the organization processes: coordination and integration, learning, and reconfiguration. We therefore measured DMC by targeting these three roles of the marketing processes.

Market orientation: five-point Likert scale anchored by strongly disagree (1) and strongly agree (5)

| | |
|---|---|
| MO_GEN02 | We do a lot of in-house market research |
| MO_GEN03 | We are quick to detect key changes in our customers' preferences |
| MO_GEN05 | We are quick to detect fundamental shifts in our industry; e.g., technology, regulations, etc. |
| MO_DIS03 | When something important happens in the market that affects a major customer, the entire business unit knows about it within a short period |
| MO_DIS05 | When one department finds out something important about our competitors, it quickly alerts other departments about it |
| MO_REP03 | We periodically review our product development efforts to ensure our efforts are in line with what customers want |
| MO_REP04 | The concerned departments get together periodically to map out our response to an important change takes place in our business environment |
| MO_REP08 | When we come up with a great marketing plan, we can implement it in a timely fashion |

IT infrastructure capability—connectivity: assess the extent to which the information can be accessed and shared with (circle the maximum extent your company has achieved)
(0): Unable to perform at all
(1): Transmission information (such as emails and memos)
(2): Access basic information (such personnel and financial information)
(3): Perform simple transactions (such as receiving and sending out orders)
(4): Perform complex transactions (such as support entire order transaction process)

| | |
|---|---|
| ITIC_C01 | Within a single business unit location |
| ITIC_C02 | Across geographically dispersed single business unit locations |
| ITIC_C03 | Across different business units domestically |
| ITIC_C04 | Across different business units abroad |
| ITIC_C05 | Customers, suppliers with the same IT base as ours |
| ITIC_C06 | Customers, suppliers regardless of IT base |
| ITIC_C07 | Anyone, anywhere |

IT infrastructure capability—functionality: assess your company's own capability in the following areas with (0) no and (1) yes

| | |
|---|---|
| ITIC_F01 | Managing firm-wide or business unit applications and databases |
| ITIC_F02 | Developing business-unit specific applications, usually on a charge back or contractual basis |
| ITIC_F03 | Electronic provision of management information; e.g., EIS or DSS |
| ITIC_F04 | Developing and managing electronic linkages to suppliers or customers |
| ITIC_F05 | Managing firm-wide communication network services; e.g., LAN and wireless |
| ITIC_F06 | Managing group-wide or firm-wide messaging services; e.g., e-mail |
| ITIC_F07 | Data management advice and consultancy services |
| ITIC_F08 | Technology advice and support services |
| ITIC_F09 | Managing, maintaining, and supporting large scale data processing facilities |
| ITIC_F10 | Performing IS planning for business units |
| ITIC_F11 | Managing and negotiating with suppliers and outsourcers |
| ITIC_F12 | Security, disaster planning, and business recovery services for firm-wide installations and applications |
| ITIC_F13 | Recommending standards for at least some aspects of the IT architecture; e.g., hardware, operating systems, data, and communications |

IT support for CRM: five-point Likert scale anchored by strongly disagree (1) and strongly agree (5)
The extent IT supports the following activities

| | |
|---|---|
| CRM01 | Identifying potential new customers |
| CRM02 | Determining the needs of existing and potential customers |
| CRM03 | Developing and executing advertising programs |
| CRM04 | Developing and executing service programs |
| CRM05 | Acquiring and leveraging information technology for customer communications |
| CRM06 | Enhancing trust and customer loyalty |

Dynamic marketing capabilities: five-point Likert scale anchored by strongly disagree (1) and strongly agree (5)
Product enhancement

| | |
|---|---|
| DM_PRO01 | Coordinating a cross-functional team to make new product/service innovation decisions |
| DM_PRO02 | Integrating key information from related industries to help new product/service innovation |
| DM_PRO03 | Continuously improving the routine process of product/service innovation |

Pricing decision enhancement

| | |
|---|---|
| DM_PRI01 | Coordinating a cross-functional team to make the price decision |
| DM_PRI02 | Integrating key information from related industries to help making the price decision |
| DM_PRI03 | Continuously improving the routine process for making the price decision |

Channel management enhancement

[2] We adopted these nine validated items from the MARKOR scale. See A.K. Kohli, B.J. Jaworski, A. Kumar, MARKOR: a measure of market orientation, Journal of Marketing Research, 30(4) 1993, pp. 467–477.

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| | |
|---|---|
| DM_PLA01 | Coordinating a cross-functional team to develop channel strategies |
| DM_PLA02 | Integrating key information from related industries to help channel developments |
| DM_PLA03 | Continuously improving the routine process for channel developments |
| Promotion enhancement | |
| DM_PMO01 | Coordinating a cross-functional team to make promotion decisions |
| DM_PMO02 | Integrating key information from related industries to help making promotion decisions |
| DM_PMO03 | Continuously improving the routine process for conducting promotions |

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