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Building and leveraging information in dynamic environments: The role of IT infrastructure flexibility as enabler of organizational responsiveness and competitive advantage

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ABSTRACT

Understanding how IT contributes to a firm's competitive advantage has long been of interest. While managers have made significant investments in IT, inflexible legacy systems hinder their ability to respond quickly to market opportunities. Our study examined *how* the flexibility of an organization's IT infrastructure enhanced information generation and dissemination and that this increased their ability to respond to rapidly changing environments. Our discussion of these information building and information leveraging effects was grounded in the resource-based view of the firm. We empirically tested our model using data collected from senior executives of 105 manufacturing and service firms. We found that IT infrastructure flexibility was positively related to information generation and dissemination. Moreover, information generation was significantly related to organizational responsiveness. Finally, organizational responsiveness was positively related to the firm's competitive advantage. These results showed the importance of developing a flexible IT infrastructure that can be quickly adapted and reconfigured to meet information processing demands in dynamic environments.

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1. Introduction

The ability to respond to market opportunities is a critical success factor for firms operating in contemporary business environments. The increasing pace of globalization, competitive rivalry, shifting customer demands, and rapid technological advancements creates an environment in which sustained competitive advantage is difficult, if not impossible, to achieve.

However, empirical evidence shows that IT infrastructure does not contribute directly to a firm's competitive advantage [3], though certain infrastructure characteristics, particularly those that enhance flexibility, allow complementary resources to be better leveraged. Indeed, IT infrastructure may contribute to firm performance by deriving synergies with factors such as absorptive capacity, agility, and market orientation [13,25].

On the other hand, an inflexible IT infrastructure may lead to delays, rushed implementations, and limited information sharing, thus impeding the firm's ability to respond to market opportunities [28]. Legacy systems are often rigid, which also limits an organization's ability to respond to external opportunities. Furthermore, attempts to upgrade such systems often lead to performance issues without increase in flexibility.

However, for IT infrastructure flexibility to have a major effect on performance, the company must be able to take advantage of its informational outputs. One way in which a company can do this is through establishing a strong market orientation: generating, disseminating, and responding to market intelligence pertaining to current and anticipated customer needs. IT infrastructure can help do this.

The objective of our research was therefore to investigate how the synergy derived from IT infrastructure flexibility and market orientation can provide contemporary organizations with a competitive advantage. While IS researchers have examined the effect of IT capabilities on market orientation at the group level [20], we have found no research to date that has empirically tested the nomological network surrounding IT infrastructure flexibility, market orientation, and competitive advantage.

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Such a test could provide insight into how IT infrastructure *indirectly* impacts competitive advantage through market orientation [15].

2. Theoretical foundation

Much of the initial research on IT business value adopted the structure-conduct-performance (SCP) model of industrial organization economics; this model argues that firms should develop their strategy around activities that give them an attractive position relative to competitors. However, this argument was questioned in the strategy literature, where it was suggested that it is important to examine factors internal to the firm in understanding the source of competitive advantage. Scholars have argued that the resource-based view of the firm provides an appropriate theoretical perspective in investigating how such internal factors can be a source of competitive advantage.

2.1. Resource-based view of the firm

The resource-based view of the firm (RBV) conceptualizes business enterprises as portfolios of resources and capabilities. Competitive advantage result from the deployment and use of valuable, rare, and inimitable resources. Moreover, firms that possess inimitable or non-substitutable resources often enjoy sustained competitive advantage.

Firms leverage two distinct strategic mechanisms to build and sustain competitive advantage: resource-picking (creating economic rents by applying superior knowledge) and capability-building (building unique capabilities from the resources) [18]. These make the firm more valuable and inimitable, thereby making them superior in providing long-term performance.

Within the IS field, researchers leveraged this view to investigate the conditions under which IT creates value [27]. A principal finding was that IT resources created value when they operated in a synergistic manner with complementary organizational capabilities and resources [19,26]. For example, IT capabilities indirectly enhance firm performance through firms' market-access and functionality-related competency [22]. At the process level of analysis, a team's IT leveraging ability indirectly influences competitive advantage in new product development through functional competencies and dynamic capabilities. Table 1 provides a summary of empirical studies which examined the synergistic creation of IT-based value. However, we still lack understanding of how "chains of capabilities" can consistently contribute to performance advantage. We specifically investigated how a flexible IT infrastructure could help firms build and leverage relevant information in response to market opportunities.

2.2. IT Infrastructure

IT infrastructure creates firm value [1,9,17]; it allows firms to share information across business units (internally) and business partners (externally). However, the existence of open architectures and standardized software packages limits IT infrastructure from being a direct source of competitive advantage, because from such an infrastructure – while valuable – may not be heterogeneously distributed or inimitable. Thus, we investigated the extent to which the *flexibility* of a firm's IT infrastructure could indirectly contribute to the firm's competitive advantage.

IT infrastructure flexibility depends on the degree to which the IT infrastructure is scalable, compatible, modular, and can handle multiple business applications [5]. Modularization of a flexible IT infrastructure allows firms to integrate disparate and geographically distributed systems. Yet to develop and maintain this requires managers to adopt and implement a shared set of IT standards and policies. When standards and policies are in place, firms can share information across internal business units and external partners. Furthermore, its characteristics allow firms to adopt, implement, and upgrade new systems in response to evolving business needs.

A flexible IT infrastructure allows an organization to respond to environmental change; a recent empirical study showed that there was a relationship between IT infrastructure capabilities and organizational agility [8]. CIOs often rank *ability to develop an efficient and flexible IT infrastructure* as their most important priority in helping their organization achieve innovation and better performance. Moreover, firms increasingly leverage their IT investments to innovate and exploit opportunities to create competitive advantage.

Table 1
Empirical studies that examine IT-based value from a resource-based view.

Ref. no.	IT capabilities assessed	Empirical approach	Major findings
[1]	Conceptualized infrastructure, human IT, and intangibles (none were measured)	Secondary data	Firms rated as having superior IT capabilities were found to have better financial
[14]	Strategic IT alignment and its process and content components	Primary data	Alignment between the IT plan and the business plan creates IT-based value for the firm
[29]	E-commerce capability, IT infrastructure	Primary data	The interactive effect of e-commerce capability and IT infrastructure increases firm performance
[3]	IT business experience, IT infrastructure quality, relationship infrastructure	Primary data	IT business expertise and relationship infrastructure have a significant effect on competitive advantage.
[22]	IS operations capability, IS planning sophistication, IS support maturity, systems development capability	Primary data	IT capabilities indirectly enhance firm performance through market-access and functionality-related competency
[23]	Generic information technologies, IT infrastructure flexibility, IT spending, shared knowledge, technical IT skills	Primary data	Managerial IT knowledge leads to enhanced customer service performance. A complementary interaction between IT applications and managerial IT knowledge enhances performance
[24]	E-commerce competence	Secondary data	E-commerce competence indirectly influences firm performance through the generation of customer value
[10]	IT-enabled cost-efficiency, IT skills	Primary data	IT skills capability indirectly influence firm performance through online commitment
[7]	Backend integration, managerial IT skills, partner support	Primary data	Backend integration and managerial IT skills impact supply chain process performance

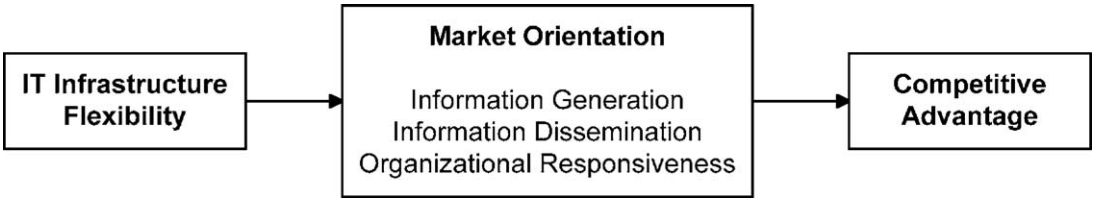

Fig. 1. Nomological network of relationships between IT infrastructure, market orientation, and competitive advantage.

2.3. Market orientation

Market orientation has been viewed as both the extent to which a firm is devoted to meeting customer needs and the extent to which a firm generates, disseminates, and responds to market intelligence about its current and future customer needs.

Hult et al. [11] tested their model linking market orientation (as both culture and information processing activities) to organizational responsiveness, which was then linked to firm performance. Their findings were that market orientation allowed the firm to respond rapidly to environmental change (e.g., shifts in customer preference), thereby enhancing performance. Similar research showed that organizational activities that focused on the generation, analysis, and dissemination of customer-related information were positively related to the firm's response capability [12].

We divided market orientation into three constructs: information generation, information dissemination, and organizational responsiveness (see Fig. 1).

3. Research model

We hypothesized that infrastructure flexibility indirectly impacts competitive advantage (Fig. 2) and that IT infrastructure flexibility is positively related to information generation, information dissemination, and organizational responsiveness (the information building effect). In turn, that information generation and information dissemination will positively affect organizational responsiveness (the information leveraging effect). Then, we assumed a relationship between organizational responsiveness and competitive advantage (performance impact).

3.1. The information building effect

The firm's IT infrastructure has been described in terms of its reach (the number of locations that the user can access) and richness (the amount of information that can be seamlessly and automatically shared). A flexible IT infrastructure exhibits several characteristics that allow effective generation and dissemination of information across business units, including scalability (to allow rapid dissemination of new information across organizational subunits), compatibility (to provide easy communication, reducing potential bottlenecks), and modularity.

Complex IT infrastructures can be decomposed into sets of subsystems until the interactions between the parts are relatively weak. A modular IT infrastructure can be characterized as loosely coupled. A flexible IT infrastructure allows initiatives such as cycle time improvement, cross-functional processes, and cross-selling

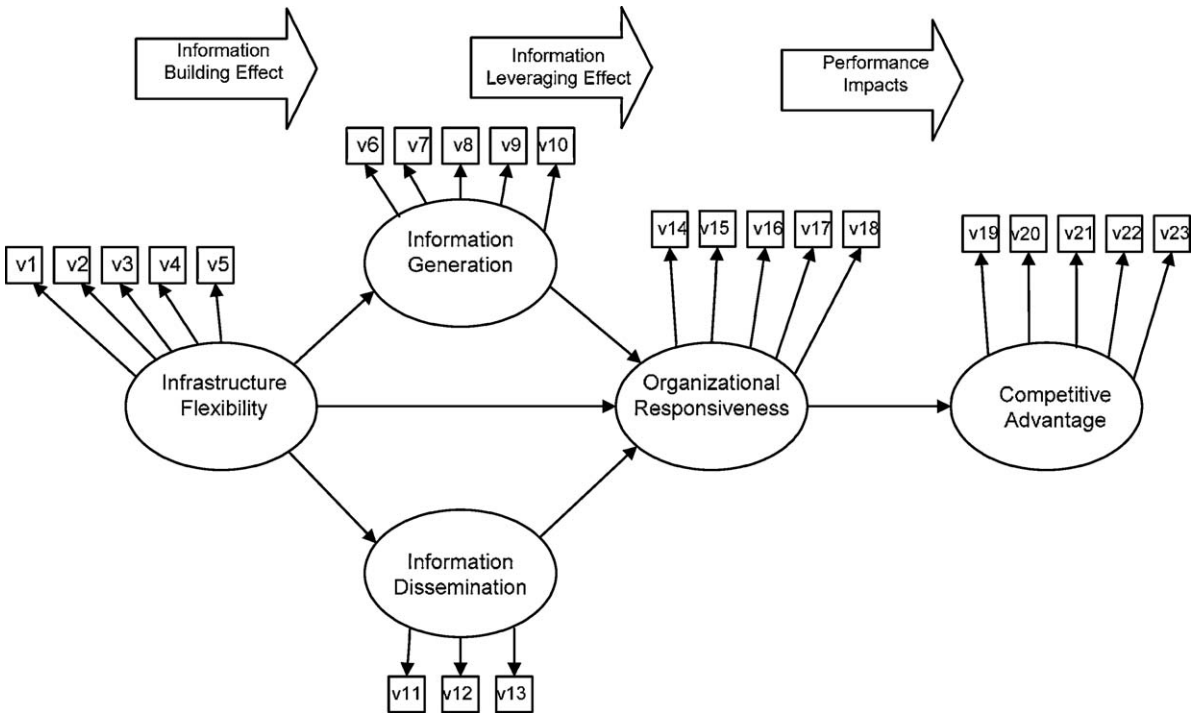

Fig. 2. Research model.

opportunities. Furthermore, flexible IT infrastructures can be quickly reconfigured to provide seamless and consistent access to relevant customer, production, order, and market data [2]. Such applications are compatible and modular (i.e., plug and play); they, can be easily added or removed as organizational requirements dictate. Hence, we hypothesized:

Hypothesis 1a. IT infrastructure flexibility will be positively related to information generation.

Hypothesis 1b. IT infrastructure flexibility will be positively related to information dissemination.

We also posit that IT infrastructure flexibility is directly related to an organization's ability to respond to environmental change. In addition to increasing information flow across organizational subunits, a scalable IT infrastructure makes it easy to expand storage, processing, and communication capacities in response to environmental change. Finally, a modular IT infrastructure allows firms to modify, upgrade, and reconfigure existing IT components quickly in response to evolving business requirements. Thus, we hypothesized:

Hypothesis 2. IT infrastructure flexibility will be positively related to organizational responsiveness.

3.2. The information leveraging effect

The ability to effectively generate and disseminate information is critical due to increased environmental change, growing global competition, and the importance of anticipating potential opportunities for innovation and competitive action. Greater levels of information generation and dissemination are more likely to provide organizations with insight into customers' expressed and latent needs. In doing so, organizations are better equipped to respond to both short- and long-term market opportunities. Thus, we hypothesized:

Hypothesis 3a. Information generation will be positively related to organizational responsiveness.

Hypothesis 3b. Information dissemination will be positively related to organizational responsiveness.

3.3. Performance impact

Response time is critical when competing in turbulent environments. Firms that are slow to respond may find that they have missed opportunities or been pre-empted by competitors. Firms that respond quickly to both customer changes and competitors often gain long-term performance benefits. Building on these arguments, we hypothesized:

Hypothesis 4. Organizational responsiveness will be positively related to business performance (competitive advantage).

4. Research method

4.1. Data collection

We conducted a survey to test our hypotheses. In the first phase, we checked the validity of the constructs by conducting a pilot study with 30 senior managers–executives in alliance with the one of the authors' School of Business program. In the second phase, based on the feedback from the executives, we reworded some questions and deleted others that executives found to be ambiguous. In the final phase, we provided respondent executives with revised questionnaires. Their responses were then analyzed to check for skewness and undue variance in the responses. All responses were normally distributed, providing initial support for construct validity.

We randomly selected 1400 respondents from a directory of 3000 firms supplied by a marketing vendor. Our survey was posted on one of the authors' school's website. To avoid the problem of unintended responses from unknown respondents, the questionnaire was protected with a username/password mechanism.

We mailed letters to the 1400 senior executives (CIO, VP of IT, Director of IT, VP of Marketing) in 1400 different firms, asking them to complete the survey or direct it to someone in their company who would be in a better position to answer the survey questions. We promised them that their responses would be kept anonymous and would be used only for statistical purposes. After two weeks, we received 225 letters back to us unopened (the executives had retired, moved to another division, or left the company). Thus our letters reached 1175 executives.

Four weeks after the initial mailing, we sent a reminder postcard to the executives asking them to complete the survey if they had not already done so. We also said that we would provide the results of the study to those who gave their name and mailing address at the end of the questionnaire. Thirty-five did so. A total of 105 usable responses were received, resulting in about a 9% response rate. Such a low response rate is not uncommon in survey research [6].

4.2. Sample demographics

Our sample consisted of a variety of manufacturing firms ($n = 49$) and service organizations ($n = 56$). Thirty-five percent of our respondents had titles of VP of IT, CIO, or business technology manager; 32% were corporate business managers; and the remaining respondents (33%) were chief managing directors, CEOs, CFOs, and managers of other technology services. Annual revenues of the firms in the sampling frame ranged from $1 million to $1 billion. Firm size, measured as number of employees, varied from 1000 to 100,000.

We conducted a chi-square test to determine whether responses varied by the types of industry (manufacturing vs. service sector) and revenue. No significant differences at the 0.05 level were noted, which suggested that perceptual measures of IT infrastructure, information generation, information dissemination, organizational responsiveness, and competitiveness were not affected by the industry type or its revenue.

Next, we assessed the potential for non-response bias. Respondents were categorized as early or late. The responses collected after sending a reminder (4 weeks) were deemed late respondents. We therefore conducted *t*-tests between early (62) and late respondents (43) on each of the survey questions, and found no significant differences at the 0.05 level. In addition, we found no significant differences at the 0.05 level in demographic characteristics, such as age, educational level, years of work experience, and years in current position. Thus we concluded that there were no non-response biases that could have affected the validity of our study.

The focus of our study was to examine how IT infrastructure flexibility affected business performance directly as well as indirectly through information generation, information dissemination, and organizational responsiveness. As a result, the range of firms' revenues was unlikely to affect the results of our study. However, given the range, we also checked whether or not significant differences existed among different categories of firms,

based on their revenues. In order to conduct a meaningful comparison between their performance, we categorized the firms into four approximately equally numbered groups. Group 1 consisted of 23 firms with revenues ranging from $1 million to $150 million. Group 2 had 31 firms with revenues ranging from $151 million to $300 million. Group 3 was of 27 firms having revenues ranging from $301 million to $500 million and Group 4 had 24 firms with revenues ranging from $501 million to $1 billion. We compared the performance of these groups by running six t-tests (group 1 to group 2, group 3, and group 4; group 2 to group 3 and group 4; and group 3 to group 4). We found no significant differences at the 0.05 level in the performance of firms based on their revenues.

4.3. Construct measurement

All research variables were measured using multi-item scales based on prior research (as shown in Appendix A). We conducted a pilot study to help establish the validity of these established measures. Scales for IT infrastructure flexibility were adapted from [3,4]. Measures for information generation, information dissemination, and organizational responsiveness were adapted from Kohli et al. [16]. Finally, we adopted established perceptual measures of competitive advantage, measured as the absolute and relative assessments of a number of dimensions of financial performance with respect to competition over a period of three years [3,21].

Perceptual performance items have been shown to correlate strongly with traditional objective measures. Due to the inability to identify all the firms, we could not verify this by obtaining objective measures for the entire sample. However, to further ensure that response biases from a single respondent in each of the firms was not loaded in a specific direction, we computed the correlation between the absolute measure of ROI of and perceptual measures of 35 firms (the executives who identified their firm's names in their responses); they were highly correlated ($r = 0.87$; $p < 0.01$). This suggested that perceptual measures of competitive advantage were not unduly loaded in a specific direction and were not likely to adversely bias the results of our study.

5. Data analysis and results

Given a model with multiple relationships, we employed LISREL for our data analysis. One of its primary strengths lies in its simultaneous estimation of the measurement and structural models. It has gained wide acceptance in the literature. We took a two-step approach where the measurement model was evaluated separately from the structural model. Doing so allowed us to purify our measures by assessing their reliability and validity. We also assessed the impact of common method bias in our analysis.

5.1. Common method bias

As the survey was completed by a single respondent, we felt compelled to test for common method bias; we extracted four factors from our results, with the first factor accounting for 42% of the variance. No single factor therefore accounted for a majority of the variance, supporting a lack of significant common method bias.

5.2. Reliability analysis

LISREL was used for our data analysis. We checked the measures by assessing their reliability and unidimensionality. The measurement model was iteratively revised by dropping items one at a time for those that share a high degree of residual variance with other items. The final value of CFI and RMR for the measurement model, based on the survived indicators (shown in Appendix A), ranged from (0.90 to 0.95) and (0.01 to 0.03), respectively, indicating a good fit between constructs and their respective identifying dimensions. The results of exploratory factor analysis for all items representing the variables also supported unidimensionality of the constructs as shown in Appendix B. Correlations, means, standard deviations, and reliabilities of constructs are reported in Table 2. Composite reliability ranged from 0.72 to 0.86, supporting reliability of the constructs. Appendix C provides item-level correlations.

5.3. Convergent validity

Composite reliability for all constructs ranged from 0.72 to 0.86, supporting convergent validity. Furthermore, standardized factor loadings of measurement items on their respective factors were all highly significant, further supporting convergent validity.

5.4. Discriminant validity

Discriminant validity was assessed using a chi-square difference test. We tested estimates of an unconstrained model that freed the correlations between pairs of factors and a constrained model that set the correlation between the factors to one. Constraining the correlation between the pairs of constructs suggests that all items measure the same construct. Thus, a significant difference between the chi-square measures would support discriminant validity. Table 3 reports the results of the chi-square difference tests. All were significant at the $p < 0.01$ level, indicating support for discriminant validity.

5.5. Structural model

We used structural equation modeling to test our hypotheses. Overall, the model demonstrated adequate fit to the data ($\chi^2 = 254$, d(f) = 203; CFI = 0.94; GFI = 0.93; NFI = 0.92; RMSEA = 0.038). Our results supported Hypotheses 1a and 1b: IT infrastructure

Table 2
Descriptive statistics, inter-construct correlations, and composite reliabilities.

Construct	Mean	S.D.	1	2	3	4	5
1. IT infrastructure flexibility	2.80	.81	0.84				
2. Information generation	2.87	.60	0.63**	0.72			
3. Information dissemination	2.73	.83	0.26*	0.28*	0.78		
4. Organizational responsiveness	2.83	.74	0.65**	0.53**	0.86**	0.86	
5. Competitive advantage	2.91	.79	0.61**	0.47**	0.30*	0.57**	0.85

Composite reliabilities are reported along the diagonal.
* $p < 0.05$.
** $p < 0.01$.

Table 3
Assessment discriminant validity.

Correlation	Chi-square (df)	Δ Chi-square for df (1)
Original model	242(199)	0
IT infrastructure flexibility and information generation constructs constrained with correlation = 1	345 (200)*	103*
IT infrastructure flexibility and information dissemination constructs constrained with correlation = 1	356 (200)*	114*
IT infrastructure flexibility and organizational responsiveness constructs constrained with correlation = 1	381 (200)*	139*
IT infrastructure flexibility and competitive advantage constructs constrained with correlation = 1	392 (200)*	150*
Information generation and information dissemination constructs constrained with correlation = 1	415 (200)*	173*
Information generation and organizational responsiveness constructs constrained with correlation = 1	347 (200)*	105*
Information generation and competitive advantage constructs constrained with correlation = 1	359 (200)*	117*
Information dissemination and organizational responsiveness constructs constrained with correlation = 1	412 (200)*	170*
Information dissemination and competitive advantage constructs constrained with correlation = 1	419 (200)*	177*
Organizational responsiveness and competitive advantage constrained with correlation = 1	394 (200)*	152*

* All differences are significant (for one degree of freedom) at 0.01 level.

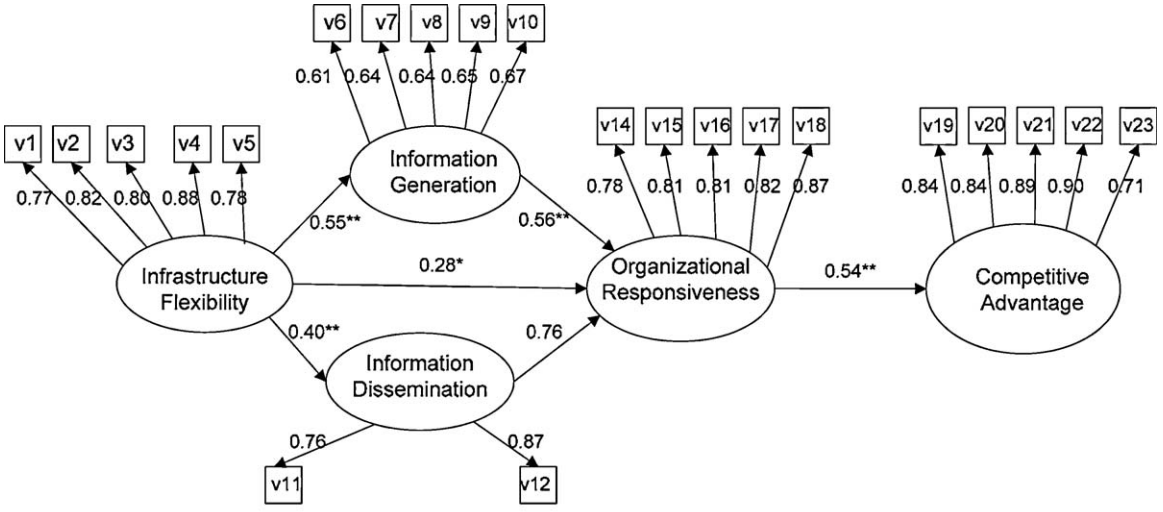

Fig. 3. Structural model results.

flexibility had a significant positive effect on information generation ($\beta = 0.55$, $p < 0.01$) and information dissemination ($\beta = 0.40$, $p < 0.01$). In addition, IT infrastructure flexibility was positively related to organizational responsiveness ($\beta = 0.28$, $p < 0.05$), supporting Hypothesis 2. With respect to information leveraging effects, information generation had a significant effect on organizational responsiveness ($\beta = 0.56$, $p < 0.01$), as did information dissemination ($\beta = .76$, $p < 0.01$). Hence, Hypothesis 3 was fully supported. Finally, organizational responsiveness was positively related to competitive advantage ($\beta = 0.54$, $p < 0.01$), supporting Hypothesis 4. Fig. 3 depicts the results of our structural analysis.

We also explored several alternative models, such as: a direct path between IT infrastructure flexibility and organizational responsiveness; a path between information generation, information dissemination, and competitive advantage; and a reverse causal path from competitive advantage to IT flexibility. All of these performed poorly when compared to the original model with respect to modification indices and differences in chi-square values.

6. Discussion

Our results generally supported the validity of our research model: IT infrastructure flexibility enhanced information generation, information dissemination, and organizational responsiveness. In turn, information generation and dissemination increased organizational responsiveness. Finally, organizational responsiveness was positively related to the firm's competitive advantage.

IT infrastructure flexibility was shown to generate information building and this directly impacted the firm's ability to respond to environmental change. In doing so, unlike treating infrastructure as a "commodity", the flexibility of the IT infrastructure is a critical organizational IT capability. Thus, IT infrastructure flexibility should not be considered a mere tool that is freely available to all industry players; rather, if flexible, it is an IT capability that has strategic ramifications.

An ability to respond rapidly is critical to firm survival and success. While many have argued that IT plays a prominent role in speeding a firm's response ability, empirical evidence has been lacking. We showed that IT infrastructure flexibility enabled organizations to respond rapidly. When information needs change, firms with flexible IT infrastructures can reconfigure and adapt their IT infrastructure according to their information processing needs. By generating relevant and timely information, firms are more likely to sense customers' expressed and latent needs. In doing so, firms are better equipped to exploit existing competencies and explore long-term opportunities. Overall, support for the model suggests that there are "chains of capabilities" that explain

links between IT investments and performance outcomes. These are internally consistent, leverage complementary resources, and are concurrent.

6.1. Limitations

Our study used the same respondent to provide both our independent and dependent variables. Statistically, common method bias did not seem to be a major problem, but we recognize that it may have biased our results. A second limitation is that we took a static cross-sectional snapshot of capabilities and competitive advantage. This makes it difficult to address the issue of how capabilities are created over time. Another limitation results from our measures of the information generation construct. The loading between all the indicators representing information generation were less than 0.70. This low level suggest a need for improvement in its measures.

7. Conclusion

We showed that IT infrastructure flexibility can generate information building effects and thus that firms can leverage information to respond to market opportunities, thereby creating competitive advantage. We showed that it is important that managers develop scalable, modular, and compatible IT infrastructures that can be quickly adapted and reconfigured, thus allowing effective information building in the organization. Thus, our study showed the importance of a cyclical loop between information building and information leveraging capabilities for a good and effective response that leads to competitive advantage. In addition, a flexible IT infrastructure facilitates both sensing and responsiveness through its configurational flexibility. This allows a firm to make specific changes to meet the needs of customers rapidly and bring new products and services quickly in the marketplace. Making decisions closer to the customers is likely to benefit both them and the firm. While customers can obtain customized products and services, the firm can gain competitive advantage because of customer loyalty.

Appendix A. Measurement items

IT infrastructure flexibility [Source: 3; 4]

V1. Our information systems are scalable.
V2. Our information systems are compatible.
V3. Our information systems are adopted to share information.
V4. Our information systems are modular.
V5. Our information systems can handle multiple business applications.

Information generation [Source: 16]

V6. Our employees communicate with customers periodically to find out what products/services they will need in the future.
V7. Our employees from manufacturing/service department interact with customers to learn how to better serve them.
V8. We are quick to detect changes in our customers' products/services preferences.
V9. Our departments independently generate intelligence on our competitors.
V10. We are quick to detect fundamental shifts in our industry (e.g., competition, technology, regulation).

Information dissemination [Source: 16]

V11. Marketing personnel spend time discussing customers' future needs with other functional departments.
V12. Data on customer satisfaction are disseminated at all levels on a regular basis.
V13*. There is a high degree of interaction between marketing and manufacturing departments regarding new products/services development.

Organizational Responsiveness [Source: 16]

V14. We quickly decide how to respond to our competitor's price changes.
V15. We tend to make quick adjustments in our customer's product/service needs.
V16. We periodically review our product/service development efforts to ensure that they are in line with what customers want.
V17. Our business plans are driven more by market research than by technological advances.
V18. Several departments get together periodically to plan response to changes taking place in our business environment.

Competitive Advantage [Source: 21]

V19. Over the past three years, our firm's financial performance has been outstanding.
V20. Over the past three years, our firm's financial performance has exceeded the competitor's performance.
V21. Over the past three years, our firm's sales growth has been outstanding.
V22. Over the past three years, profitability of our firm has been higher than our competitor's profitability.
V23. Over the past three years, our firm's sales growth has exceeded the competitor's sales growth.

Note: *The item was dropped from the analysis because of its high residual variance with other items.

Appendix B. Factor analysis – principal component method with varimax rotation

	IT infrastructure flexibility	Information generation	Information dissemination	Organizational responsiveness	Competitive advantages
V1	0.831	0.474	0.224	0.13	0.293
V2	0.842	0.356	0.222	0.25	0.254
V3	0.784	0.423	0.191	0.24	0.194
V4	0.693	0.392	0.182	0.18	0.116
V5	0.752	0.394	0.216	0.18	0.237
V6	0.123	0.784	0.236	0.29	0.337
V7	0.194	0.695	0.295	0.31	0.258
V8	0.215	0.712	0.314	0.27	0.273
V9	0.236	0.631	0.162	0.29	0.252
V10	0.257	0.722	0.193	0.18	0.221
V11	0.262	0.237	0.826	0.19	0.164
V12	0.281	0.249	0.798	0.21	0.114
V14	0.313	0.243	0.247	0.81	0.187
V15	0.214	0.122	0.228	0.72	0.198
V16	0.195	0.143	0.21	0.69	0.258
V17	0.184	0.124	0.22	0.72	0.245
V18	0.175	0.195	0.24	0.78	0.225
V19	0.346	0.156	0.17	0.14	0.827
V20	0.232	0.155	0.16	0.18	0.792
V21	0.161	0.163	0.12	0.15	0.802
V22	0.182	0.212	0.15	0.19	0.754
V23	0.213	0.121	0.13	0.24	0.761

Appendix C. Correlation matrix between items used in the variables

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23
V1	1	0.806**	0.801**	0.800**	0.823**	0.589**	0.618**	0.622**	0.609**	0.617**	0.249*	0.287*	0.661**	0.643**	0.654**	0.764**	0.656**	0.690**	0.653**	0.689**	0.639**	0.654**
V2		1	0.826**	0.828**	0.806**	0.528**	0.638**	0.625**	0.604**	0.666**	0.377*	0.279*	0.606**	0.705**	0.612**	0.643**	0.721**	0.723**	0.612**	0.649**	0.586**	0.693**
V3			1	0.793**	0.864**	0.619**	0.608**	0.645**	0.666**	0.690**	0.366*	0.307*	0.743**	0.612**	0.611	0.612**	0.567**	0.712**	0.659**	0.764**	0.743**	0.590**
V4				1	0.830**	0.602**	0.614**	0.617**	0.606**	0.610**	0.334*	0.324*	0.721**	0.628**	0.763**	0.734**	0.654	0.671**	0.732**	0.569**	0.554**	0.621**
V5					1	0.611**	0.673**	0.686**	0.691**	0.628**	0.258*	0.384*	0.623**	0.706**	0.724**	0.630**	0.656**	0.643**	0.654**	0.651**	0.689**	0712**
V6						1	0.813**	0.814**	0.838**	0.821**	0.344*	0.295*	0.549**	0.512**	0.549	0.602**	0.511**	0.569**	0.531**	0.512**	0.530**	0.583
V7							1	0.845**	0.838**	0.847**	0.262*	0.309*	0.518**	0.598**	0.609	0.614**	0.673**	0.513**	0.454**	0.544**	0.531**	0.453**
V8								1	0.819**	0.864**	0.272*	0.328*	0.521**	0.577**	0.765	0.676**	0.587**	0.515**	0.495**	0.512**	0.422**	0.564**
V9									1	0.847**	0.302*	0.343*	0.619**	0.604**	0.566	0.609**	0.591**	0.538**	0.538**	0.519**	0.422**	0.405**
V10										1	0.392*	0.235*	0.567**	0.666**	0.500	0.619**	0.629**	0.554**	0.548**	0.454**	0.401**	0.523**
V11											1	0.870**	0.274*	0.276*	0.366*	0.312*	0.378*	0.344*	0.342*	0.373*	0.386*	0.322*
V12												1	0.312*	0.379*	0.318*	0.384*	0.378*	0.396*	0.309*	0.401*	0.341*	0.335*
V14													1	0.821**	0.811**	0.810**	0.813**	0.791**	0.628**	0.513**	0.609**	0.612**
V15														1	0.814**	0.818**	0.812**	0.828**	0.598**	0.543**	0.604**	0.516**
V16															1	0.813**	0.822**	0.817**	0.608**	0.587**	0.567**	0.600**
V17																1	0.810**	0.802**	0.614**	0.556**	0.598**	0.610**
V18																	1	0.811**	0.573**	0.578**	0.593**	0.625**
V19																		1	0.613	0.514	0.558**	0.521
V20																			1	0.834**	0.838**	0.847**
V21																				1	0.821**	0.824**
V22																					1	0.837**
V23																						1

* $p \le .05$.
** $p \le .01$.

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