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An Empirical Examination of the Relationship between Information Technology (IT) Infrastructure, Customer Focus, and Business Advantages

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ABSTRACT

During the past two decades, both academic researchers and business managers have attempted to understand the ways through which information technology (IT) can create business advantages. In this paper, we present a model that tests the relationship between IT infrastructure, customer focus, and business advantages. Customer Focus has been categorized into: customer responsiveness and product/service innovation. The data for the study were obtained from 116 executives from a number of business organizations. IT infrastructure is found to have significant effect on customer responsiveness, but does not show any significant relationship with product/service innovation. IT infrastructure, customer responsiveness, and product/service innovation are found to be significantly related business advantages.

Keywords

IT infrastructure, customer responsiveness, product/service innovation, business advantages

INTRODUCTION

Since the early-90s, academic researchers and managers are attempting to find the ways through which information technology can create business advantages for the firm. In the 1980s, a growing body of the literature argued that IT can help a firm by raising the entry barriers, increasing the bargaining power with suppliers and customers, and offering new products and services (McFarlan, 1984; Porter and Miller, 1985). However, over the years, a number of scholars have noted that sustaining advantages through IT might be difficult, because such applications are eventually imitated and appropriated by the competitors (Mata, et al., 1995). Although there are theoretical, methodological, and measurement issues leading to these inconsistent results, there is a growing realization that IT in itself cannot be a source of the competitive advantages. Instead, it is the firm level capability that realizes the benefits from IT.

In other words, how a firm leverages IT for its advantages that becomes the focus of the study (Bharadwaj, 2000; Bhatt and Grover, 2005). Therefore, the main aim of the present paper is to explore the linkages of IT infrastructure, customer focus, and business advantages.

INFORMATION TECHNOLOGY (IT) INFRASTRUCTURE

An IT-infrastructure allows a firm to share IS resources (Broadbent, et al, 1999). A flexible IT infrastructure is a useful mechanism for integrating disparate and geographically distributed systems and making IT applications cost effective in their operation and support. As IT becomes distributed throughout firms and even beyond their boundaries, IT managers and their business partners need well-defined rules for distributing hardware, software, and support.
CUSTOMER FOCUS

Customer focus refers to organizational commitment to identify and satisfy customer concerns about the quality and timeliness of their orders as well as meet their demands in new products in services (Pine II et al. 1993). Since customers’ expectations and demands are dynamic, it is necessary that companies pay close attention to track customers’ demands in products and services and develop their capabilities in meeting those demands quickly. For example, by keeping track of customer complaints and causes of their dissatisfaction, an organization can proactively plan to correct the causes of customer dissatisfaction. Furthermore, by acquiring and evaluating customers' requirements thoroughly and disseminating this information within the organization, a firm helps to reduce inter-functional problems. On the basis of extensive literature review, customer focus is categorized into two dimensions: customer responsiveness and product/service innovation (Rosenthal, 1992).

RESEARCH MODEL

The study presented here empirically examines the effect of IT infrastructure flexibility on customer focus and business advantages. Customer focus has been categorized into: customer responsiveness and product/service innovation. The model posits that IT infrastructure flexibility can contribute directly to customer focus, and in turn, customer focus affects competitive advantages. In addition, a flexible IT infrastructure can also help a firm in realizing its business advantages.

![Research Model Diagram](image)

**Figure 1. Research Model**

RELATIONSHIPS

*IT Infrastructure and Customer Responsiveness*

One of the prime goals of IT infrastructure is to transform internal and external business processes, thus providing the advantages of customer focus. The goal of a firm, thus, should be to address customer concerns and improve the linkages between the firm and the customers so that it can meet customer needs. In general, a standard and flexible IT infrastructure can help customers in placing their orders, selecting different options, and paying through the credit cards through a simple click of the mouse. Thus IT infrastructure becomes a potent source of creating value by transforming the business processes. Increasingly sophisticated developments in intelligent agents, data warehouses, customer relations management (CRM) and other supply-chain initiatives between extended enterprises show that IT infrastructure flexibility can play an important role in enhancing customer focus (Karimi, et al, 2001). Thus we hypothesize:

**Hypothesis 1:** Higher level of IT infrastructure will have a positive effect on customer responsiveness.
IT Infrastructure and Product/Service Innovation

Traditionally, firms used to develop new products and services through sequential decision making between the manufacturing, marketing and research and design departments. In a fast and dynamic business environment, this process has become ineffective, since for rapid product and service development, joint decisions between the firm (marketing, manufacturing, and research and development departments) as well as customers and suppliers become critical. A shared IT infrastructure, by providing simulation and modeling capabilities, permits a firm to design and manufacture prototypes for testing their reliability and interfaces with other actual physical components, thus allowing them to work with more designs and products in less time.

Hypothesis 2: Higher level of IT infrastructure will have positive effect on product/service innovation.

Customer Focus and Business Advantages

Customer focused firms strives to create and maintain long-term relations with its customers. It is generally agreed that a firm that is equipped to create, maintain and manage customer relationship over the life of a customer is at a better position to sustain its advantages (Glazer, 1991). In this perspective, businesses are encouraged to take notice of the customer’s life cycle. In other words, it is no longer sufficient to create a transaction with a customer, rather, the firm should decide to capture customers over their lifetimes to decide what they want and how to deliver those products and services to them. Therefore, firms that try to understand customers’ needs sooner can meet their demands in products and services. The firm also incurs less cost in its marketing efforts, gaining a part of business advantages as a result of target marketing. As customers suggest their preferences in a product or a service, the firm can use these suggestions as an opportunity. Therefore, we hypothesize:

Hypothesis 3: Higher level of customer responsiveness will have positive effect on business advantages.

Hypothesis 4: Higher level of product/service innovation will have positive effect on business advantages.

IT Infrastructure and Business Advantages

Traditionally IT has been considered a competitive weapon in raising the entry barriers, increasing the bargaining power with suppliers and customers, and offering new products and services (McFarlan, 1984; Porter and Miller, 1985; Porter, 1996). Similarly, transaction cost economics (TCE) perspectives views that firms that had contributed to asset specific investments in unique supplier IT, processes, or training, are unlikely to switch to another supplier (Bakos and Treacy, 1986; Clemons and Row, 1991). Thus these investments are likely to be source of the competitive advantages. In recent years, the research has moved toward RBV (resource based view) of the organization. According to RBV, competitive advantage is rooted in the deployment and use of idiosyncratic, valuable, and inimitable resources and capabilities. Capability-building refers to the ability of firms to build unique competencies and capabilities that can leverage their resources (Teece, et al, 1997). Firms are heterogeneous in developing and exploiting the use of IT-infrastructure, therefore, they are likely to have different potential in leveraging IT for their competitiveness (Barney, 1991). Therefore, we hypothesize:

Hypothesis 5: higher level of flexible IT infrastructure will have a positive effect on business advantages.

METHODOLOGY

Data Collection

We conducted a survey for our study. An instrument was targeted at 1400 senior executives (CIO, VP of IT, director of IT, VP of marketing) randomly selected from a directory of 3000 firms, supplied by a marketing vendor. The survey was posted on authors’ university’s website. We mailed letters 1400 senior executives, requesting them to complete the survey or direct someone in their company who would be in the best position to answer the survey questions. We promised them that their responses will remain anonymous and would be used only for statistical purposes. We also promised them a copy of the results if they fill their names and addresses at the end of the questionnaire. The senior executive is the appropriate respondent for being well versed with its business strategies relating to customer focus, IT-infrastructure flexibility, and business advantages. This is consistent with Huber and Power’s (1985) recommendation that in the case where one respondent per unit is solicited, it should be the most informed respondent. 116 usable responses were received, resulting in about 8% response rate. This low response rate in not uncommon in the IS area, as it reflects the challenges in obtaining responses from top management (Ferratt, et al., 1999).

Measurements

Using the guidelines suggested by Straub (1989), a three-phase instrument development process was undertaken. In the first phase, a thorough review of the literatures from IS, marketing, and strategy area was conducted to identify the key variables that had been either operationalized or theoretically explained. If existing measures were not available, a list of items
covering the domain of the variables under investigation was developed (Churchill, 1979).

In the second phase, to establish the content validity of the constructs, a list of defined constructs and measures was submitted to a group of three academicians and two executives. We requested the group members to assign each measure to the construct that they believed was appropriate and asked whether they thought the construct could be represented by any other measures. In this phase, we took the feedback from these members and accordingly, deleted or reworded some of the items.

In the third phase we conducted a pilot study to refine the items. We identified managers in four companies who were knowledgeable in IS, marketing, and strategy areas and were willing to comment on the items in the survey questionnaires. Participants in these firms were asked to provide comments on the appropriateness and clarity of questionnaire items.

OPERATIONALIZATION

Almost all of the items were used based on prior studies. If existing measures were not available, a list of items covering the domain of the variables under the investigation was developed.

Business Advantages

For measuring the dependent variable, business competitive advantages, we used perceptual measures. Several researchers have used perceptual measures for business value, productivity, or profitability (e.g., Powell and Dent-Micallef, 1997).

RELIABILITY AND VALIDITY ANALYSIS

To assess the reliability of the measures Cronbach’s Alpha coefficient was estimated. A value more than 0.75 was considered appropriate for the analysis (Kerlinger and Pedhazur, 1973). All of the values of Cronbach Alpha were more than .90, thus confirming the reliability of the constructs with their respective items as shown in Table 1.

<table>
<thead>
<tr>
<th>IT - infrastructure</th>
<th>Product/service innovation</th>
<th>Customer responsiveness</th>
<th>Business advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item1 0.9217</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item2 0.9034</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item3 0.9097</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item4 0.9052</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Alpha = 0.98215</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

|                           | Item1 0.9944               |                         |                     |
|                           | Item2 0.8897               |                         |                     |
|                           | Item3 0.9778               |                         |                     |
|                           | Item4 0.9166               |                         |                     |
| **Alpha = 0.899133**     |                           |                         |                     |

|                           | Item1 0.9138               |                         |                     |
|                           | Item2 0.9021               |                         |                     |
|                           | Item3 0.9138               |                         |                     |
|                           | **Alpha = 0.9736**         |                         |                     |

|                           | Item1 0.9702               |                         |                     |
|                           | Item2 0.9603               |                         |                     |
|                           | Item3 0.9581               |                         |                     |
|                           | Item4 0.9870               |                         |                     |
| **Alpha = 0.9843**       |                           |                         |                     |

Table 1  Reliability Analysis of Constructs

Finally, we conducted a factor analysis on all of the items, representing IT-infrastructure, product/service innovation, customer responsiveness, and business advantages. A varimax rotation method was used to maximize the sum of the variance of the loading vectors. As expected, we obtained 4 clean factors showing the construct validity of the items.
representing IT-infrastructure, product/service innovation, customer responsiveness, and business advantages. To test divergent validity of the instrument, all of the multi-item measures and factors were correlated. The average correlation between the scale and scale-items was substantially higher than between the scale and non-scale items, confirming the divergent validity of the instrument.

TESTING THE RELATIONSHIPS

Before running these multiple regression analysis, we checked for the multicollinearity between customer responsiveness, and product/service innovation. The variables were moderately correlated. We, therefore, conducted two multiple regressions between customer focus and business advantages, by changing the order in which customer responsiveness, and product/service innovation variables were incorporated in the regression analysis. In each of the cases, the results remained unchanged irrespective of which variable was incorporated first and which was incorporated last. These results suggest that multicollinearity did not inflate our results. From Table 2, it is evident that customer responsiveness as well as new product/service innovation is found to be significantly correlated with business advantages. These results show the significance of customer focus on business advantages.

The regression analysis between IT infrastructure and customer responsiveness shows a significant relationship of IT infrastructure with customer responsiveness, however, the relationship between IT infrastructure and product/service innovation was not found to be significant. IT infrastructure on business advantages was found to be significantly related as shown in Table 4.

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Dependent Variable</th>
<th>R² (adjusted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT—infrastructure</td>
<td>Product/service innovation</td>
<td>.016</td>
</tr>
<tr>
<td>IT—infrastructure</td>
<td>Customer responsiveness</td>
<td>.103</td>
</tr>
<tr>
<td>IT—infrastructure</td>
<td>Business advantage</td>
<td>.131</td>
</tr>
<tr>
<td>Customer responsiveness</td>
<td>Business advantage</td>
<td>.339</td>
</tr>
<tr>
<td>Product/service innovation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Regression Models on Customer Focus and Business Advantage

*p <= .01
**p <= .005

RESULTS

With regard to the specific hypotheses, we found:

Hypothesis 1: Our results supported the hypothesis that a higher level of IT infrastructure would have a significant positive effect on customer responsiveness (Standardized B = .321, p<=.005)

Hypothesis 2: Our results failed to support that a higher level of IT infrastructure has significant positive effect on product/service innovation (Standardized B = .128, non significant)

Hypothesis 3: Our results supported the hypothesis that a higher level customer responsiveness would have a significant positive effect on business advantages (Standardized B = .241, p<=.01)

Hypothesis 4: Our results supported the hypothesis that a higher level of product/service innovation would have a significant positive effect on business advantages (Standardized B = .437, p<=.005)

Hypothesis 5: Our results supported the hypothesis that a higher level of IT infrastructure would have a significant positive effect on business advantages (Standardized B = .372, p<=.005)
DISCUSSION AND CONCLUSION

As expected, IT infrastructure has positive and significant effect on customer responsiveness. High powered computers, integrated with sharing and other digital media, not only offer advantages in data mining purposes but also help in customizing promotional activities. By acquiring historical data about customers’ specific choices and demands in products and services, a firm can introduce new products and services in the marketplace sooner than their competitors. Our results did not support the results that IT infrastructure would have significant positive results on product/service innovation. Though the result is contrary to expectations, the reason could be that development activities for new products/services may require face-to-face meetings among involved parties. In addition, just exchange of information could not be the best way when the specifications of new products/services are yet not standardized. In the preliminary stage of the development, therefore, IT could be an enabler, but its main effect is unlikely to be significant. Moreover, bringing new products and services in the marketplace requires management commitment, research & development support, and inter-functional skills in understanding customer demands in products and services (Treacy and Wiersema, 1993).

As expected, customer responsiveness and product/service innovation are found to have significant positive effect on business advantages. Because customer responsiveness is a marketing implementation issue, it is likely to affect business advantages positively (Treacy and Wiersema, 1993; Slater and Naver, 1999). Product/service innovation involves making conscious efforts to develop new product/services and improve on existing products and services to meet the customer demands (Jaworski and Kohli, 1993; Slater and Narver, 1999; Jaworski, et al., 2000). As the competition among companies increased globally, firms are finding that mass manufacturing alone would not provide the competitive advantages. In addition, firms are required to innovate continually and provide new quality products/services to the customers. Not only customers are demanding quality and innovating products/services, they are also looking different ways for obtaining customized products/services.

Finally, as expected IT infrastructure has a significant positive relationship with business advantages. Since flexible IT infrastructures build the backbone of the firms for communication and exchange of information, the effect of IT infrastructure on business advantages is likely to be durable. Not only IT infrastructure enhances the competitiveness of the firms by increasing the coordination within and across the organizations, but also it can be an integral component of the business strategy (Henderson and Venkatraman, 1993; Laudon and Laudon, 2000). Thus, a flexible IT infrastructure may not only be important for driving business growth but also it could be a catalyst for innovation (Henderson and Venkatraman, 1993). Moreover, IT is important to improve operational efficiency and strategic advantages by reducing costs, improving agility, managing change, and maximizing performance (Henderson and Venkatraman, 1993).

KEY REFERENCES


