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ELECTRONIC COMMERCE AND A RESOURCE-BASED VIEW OF THE FIRM

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Abstract

According to the resource-based view, a firm's performance is founded on its unique capabilities and its competitors' difficulty in imitating them. A study of 473 e-commerce retailers considered the impact of technology, human, and business resources on competitiveness. It provided partial support for the view. The findings have implications for e-commerce researchers and managers.

Keywords: E-commerce, resource-based view, e-commerce strategy, web site design, e-commerce planning

Introduction

Few organizations, if any, are debating whether or not to participate in e-commerce. Instead, they are concerned about how and to what extent to do so. To make these decisions, management is interested in knowing what resources make e-commerce applications successful. By understanding and enhancing the particular requisite resources, managers could improve e-commerce in their organizations.

Researchers are interested in the resources that might make e-commerce successful because a management theory, a resource-based view of the firm, states that resources predict organizational success (Barney, 1991, Powell and Dent-Micallef, 1997). That theory is growing increasingly popular, but has not been examined in the context of e-commerce.

The research described here applies a resource-based view of the firm to predict e-commerce success. It relies heavily on a previous study of conventional retailing that also applied a resource-based view (Powell and Dent-Micallef, 1997).

E-commerce and the Resource-Based View

E-commerce has been broadly defined as "any form of economic activity conducted via electronic connections" (Wigand et al., 1997, p. 260). It can be categorized into three major types: retailing (i.e., consumer shopping), business-to-business commerce, and intraorganizational business. This study focuses on retailing.

According to the resource-based view, a firm's performance is founded on its unique capabilities (i.e., resources) and its competitors' difficulty in imitating them. The resources must be valuable, heterogeneous, immobile, and non-substitutable (Mata, et al., 1995). In other words, certain resources of a firm with these characteristics will lead to sustainable competitive advantage. Thus, managers should ask themselves these questions about each resource: 1) Is the resource valuable? 2) Is it heterogeneously distributed across competing firms? 3) Is it imperfectly mobile? 4) Is it non-substitutable? Only if the answer is yes to all of these questions can the resource be a source of sustained competitive advantage.

Powell and Dent-Micallef (1997) used three resources in their study of retailing, namely, business resources, human resources, and information technology resources. According to the resource-based view, business and human resources should predict firm performance, while the information technology resources alone should not.

Variables

Resources are the independent variables in this study. Researchers have broadly defined the concept of resources. Barney (1991, p.101) defined resources as “all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness.” Clemons and Row (1991, p. 279) called them “any long-lived productive capability.”

This study does not propose to consider all resources of a firm. Instead, it focuses on e-commerce technology resources and how they can work together with their complementary resources to provide firm competitiveness.

Complementary resources are a class of resources, a collection of resources that are not specialized to a particular innovation, but that may be impacted by the innovation. In other words, the value of these complementary resources can be enhanced due to the presence of other resources. Dierickx and Cool (1989, p.1508) referred to complementary resources as “interconnected asset stocks.”

Thus, the independent variables in the current research are the resources necessary to participate in e-commerce. The study adapts the complementary human resources, complementary business resources, and information technology resources of Powell and Dent-Micallef (1997).

The information technology resources, known more specifically as e-commerce technology resources in this study, included interactivity, publishing applications, community applications, catalog applications, transaction applications, performance, and interface. They are described in the e-commerce literature from which survey items for this study were developed.

The complementary human resources of current research were based on Powell and Dent-Micallef’s (1997) human resources with minor modification to their survey items. They were open organization, open communications, CEO commitment to e-commerce, and flexibility.

The authors made changes to the business resources of Powell and Dent-Micallef (1997) for this study. The rationale for the adjustments to the sub-dimensions is based on differences between IT in general (as considered by Powell and Dent-Micallef, 1997) and e-commerce as a specific application of IT. Sub-dimensions relevant as resources of e-commerce remain. Some other sub-dimensions unique to e-commerce are added to bring the total to six. The six were partner relationships, customer relationships, IT-business relationships, process redesign, benchmarking, and e-commerce planning

This research used three dependent variables for performance and tested hypotheses with each. Two of them were e-commerce performance (analogous to Powell and Dent-Micallef’s IT performance) and overall company performance (identical to Powell and Dent-Micallef’s overall company performance). The third was a new variable, e-commerce benefits.

Hypotheses

According to the resource-based view, any universally available resource of a firm would not bring competitive advantage to the firm. And most would agree that e-commerce technology, much like IT, is universally available to all competitors. The tools for building e-commerce capability have become commodities.

Thus, the benefits of e-commerce will not be realized by e-commerce technology resources alone. They will have to be accompanied by other resources (e.g. human and business resources) to achieve the real benefits of e-commerce. Hence, the following hypothesis is proposed:

H1: E-commerce technology resources do not explain significant performance variance among firms.

Clearly, for any technology to be successful, people play an important role. Contrary to e-commerce technology resources, complementary human resources tend to meet the four criteria -- e.g. to be valuable, heterogeneous, immobile, and non-substitutable -- (Mata, et al., 1995) that are required for the firm’s resources to provide sustainable competitive advantage. For example, organizational cultures can be powerful sources of competitive advantage. Academic researches and practitioner-directed studies in the IT area strongly support the relationship of human resources and IT performance. Similar to Powell and Dent-Micallef (1997), the following hypothesis is proposed with the expectation:

H2: Human resources complementary to e-commerce create advantages that explain significant performance variance among firms.

E-commerce is more than a new information technology. It changes the way business is conducted both inside and outside the firm. When the business environment is changed, retailers need to adjust their internal business processes and concomitant resources in order to compete. While e-commerce technology resources might be imitated, business resources can be difficult to copy. Even in cases where partial duplication is possible, benefits cannot be easily realized. For example, any retailer can visit successful online stores, and examine and imitate their merchandise, the layout of their sites, their transaction processing, their customer services, and their delivery services. But that retailer cannot necessarily imitate their business resources and as a result become successful.

Business resources can be a potential source for a firm to sustain competitive advantage. For example, virtual enterprises with task focused organizational structure can benefit more from e-commerce applications than firms with other organizational structures. When a competitor wants to imitate any IT applications of a firm, it also needs to change the business resources which incur considerable cost, or can be impossible. The fit between the business resources and e-commerce is critical for its success. Hence, the following hypothesis is proposed:

H3: Business resources complementary to e-commerce create advantages that explain significant performance variance among firms.

By testing these hypotheses, this research answers the question, what resources make e-commerce applications successful?

Methodology

The research focused on the retail industry for several reasons. The retail industry has been an early participant in e-commerce. Due to the Internet's surging popularity and the increased consumer confidence in its security, business-to-consumer e-commerce in the retail industry has become more attractive and popular. Moreover, retailers often use IT to improve customer service, reduce costs, and compete more effectively. Such retailers as Wal-Mart and Tesco have created substantial competitive advantage by using e-commerce.

Subjects were managers responsible for their organization's e-commerce. Two major retailer portals were selected based on their popularity and representativeness to identify those managers. The first was www.mysimon.com. At the time of data collection, it had over 2000 retailers. The other was stores.yahoo.com. It had over 5000 retailers. Many sites were cross posted on both portals and their duplicates were eliminated. The e-mail addresses were collected by visiting each retailer's site.

To improve reliability and validity of the data, the questionnaires were evaluated rigorously by pilot testing prior to administration. Five local retailers who had e-commerce sites agreed to participate in the survey. These pilot subjects completed the survey and provided comments through face-to-face communications. They also discussed the benefits and features of their e-commerce sites. Their oral comments were consistent with the answers on the survey. The focus of these pilot tests was the wording and understandability of the items, the time taken to complete the answers, and the sequence of the questions.

The survey was revised after each of the first four pilot tests to make it clearer and easier to complete for managers of e-commerce sites. The fifth pilot test resulted in no changes to the instrument.

A short message was e-mailed to the subjects, namely the managers responsible for their organizations' e-commerce sites, at 4,088 companies on the two e-tailing portals. The message included the link to the survey Web site. A few days after the first e-mailing, the authors sent a second message similar to the first one to non-respondents.

The total number of responses was 852. This included 379 email responses explaining reasons the retailers could not complete the survey (e.g. firm policy, site too new, too busy, etc.), and 473 completed and thus useable surveys. The overall response rate (852/4,088) was thus 21 percent. When only usable surveys were counted, the response rate of 473/4088 was 12 percent.

The subjects represented a wide array of product lines. Almost half (43%) of the firms had their e-commerce sites less than one year. Two-thirds had their sites less than 2 years. Two hundred forty-six firms reported their annual sales, with an average of \$2.4 million and a median of \$78,000. One hundred ninety-seven firms reported their online stores profits with an average of \$250,000 and a median of \$16,000. Four hundred fifty firms reported their organizational size with an average of 408 and a median of 10. On average there were about 9 employees working on their organizations' e-commerce sites with a median of 3 employees.

Analysis

The time-trend extrapolation test was used to assess non-response bias. The assumption behind this test is that non-respondents resemble late respondents more than early respondents. Thus, to test the non-response bias, late respondents served as surrogates for non-respondents. Original and late respondents numbered 268 and 190 subjects respectively. Results obtained from the later respondents were compared to the results of early respondents. Eighty-nine of the 92 pairs of variables showed no significant differences between the answers from these two sets of respondents ($p < .050$). This is no more than would be expected from chance alone and thus suggests the lack of non-response bias.

Exploratory factor analysis was applied to 31 items of the benefits of e-commerce, the new dependent variable. The extraction method was the principal component analysis. The rotation method was Varimax with Kaiser Normalization. Eigenvalues were required to be greater than 1. The cut-off for each factor loading was .50, and each item had to load on one and only one factor. The analysis thus extracted five factors, namely back-end efficiency, marketing, inventory management, cost reduction, and customer intimacy.

Cronbach's alpha was at least .79 for each factor. Alpha was also calculated for the e-commerce performance and overall firm performance sets of items, with the results of .77 and .87 respectively. These alphas demonstrated high reliability of the measurement items.

Multivariate multiple regression tested the relationship between the measures of firm competitiveness and those of organizational resources to answer the research question, what resources make e-commerce applications successful? The variable values used for regression for the three independent variables (e-commerce technology resources, complementary human resources, and complementary business resources) were the mean values of the corresponding models. The variables' values used for regression for the three dependent variables (benefits of e-commerce, e-commerce performance, and overall firm performance) were the mean values of their indicators.

All cases with missing data were deleted. This left 322 usable cases for this analysis. Furthermore, the significance of the Pillai's F value of 21.4 ($p < .0001$) validated the use of the individual univariate regression procedures.

Three models, one with each dependent variable, were tested. All three models had the same three independent variables.

In the regression with EC benefits as dependent variable, two of the three beta coefficients were significant ($p < .001$). Only the human resources variable was not significant.

In the regression with EC performance as dependent variable, the beta coefficient of business was significant at .001 level and the beta coefficient of EC technology was significant at .05. However, the beta coefficient of the human resources variable again was not significant.

In the regression with firm performance as dependent variable, only one variable was significant. In particular, the beta coefficient of business resources was significant ($p < .001$).

The variables combined to explain 46.9% of variance in the sample and an estimated 46.4% of variance in the population for e-commerce benefits. For e-commerce performance, the variables combined to explain 33.8% of variance in the sample and an estimated 33.2% in the population. For overall firm performance, the variables combined to explain 17.9% of variance in the sample and an estimated 17.1% in the population.

Discussion

According to the resource-based view, H1 should be accepted. However, the findings were mixed, and the following results were obtained:

- E-commerce technology resources explain e-commerce benefits variance ($p < .001$). That is, H1 is not accepted with e-commerce benefits as dependent variable.
- E-commerce technology resources explain e-commerce performance variance ($p < .01$). That is, H1 is not accepted with e-commerce performance as dependent variable.

- E-commerce technology resources do not explain overall firm performance variance. That is, H1 is accepted with firm performance as dependent variable.

According to resource-based view of the firm, such resources as e-commerce technology would not provide sustainable competitive advantage because they can be easily imitated.

However, e-commerce benefits and e-commerce performance may depend on e-commerce technology resources. For example, an e-commerce site with rich e-commerce technology resources might attract and keep visitors, thus providing benefits. In effect, the technology itself turned out to be more important, but strictly in e-commerce benefits and performance in this study.

On the other hand, the reasons that e-commerce technology resources did not explain firm performance variance may be due to ease of imitation of the e-commerce technology. For example, FedEx was the first shipping firm that provided online tracking service for its customers, and within months, UPS and other shipping firms were providing the same customer service. In any case, in the current research the direct effects of e-commerce technology resources on firm performance itself were not present. In summary, the technology resources influenced success more tightly tied to the technology, but not firm performance itself.

These results resemble Powell and Dent-Micallef's (1997) findings. Their research showed that IT resources do not explain significant overall firm performance, but explain significant IT performance at .005 level.

In contrast, Powell and Dent-Micallef's (1997) findings, the tests of the data in this study rejected H2 for all three dependent variables. Perhaps human resources are imitable in the virtual world of the current study whereas they are not imitable in the physical world of Powell and Dent-Micallef's (1997) retailers. Thus, the theory could still hold, but the context would explain the contradictory findings.

In effect, the organizational culture may be much different in physical world and in virtual world in which e-commerce activities are implemented. In physical stores, employees must physically present in their offices or stores. But in e-commerce environment, employees of an online store can collaborate across the world.

On the other hand, perhaps in the virtual world humans play a less important role than they do in the physical world of retailing. Employee turnover in the virtual world is higher and thus the role of humans may be less critical.

Another explanation of the difference in findings may be firm size. In this study, samples were from online retailers, which included many small start-up firms, and the mean number of employees was 311 with a median of 10. In Powell and Dent-Micallef's (1997) study, the samples were from large retailers, and the mean number of employees was 11,540 with a median of 3,000).

Finally, the human resources items in the current survey were the least modified set from Powell and Dent-Micallef's (1997) survey. Perhaps they should have been modified more to reflect the virtual world.

The tests of the data accepted H3. In other words, complementary business resources explained significantly all three competitiveness measures. This finding thus provides powerful support for the resource-based view for business resources.

According to the resource-based view of the firm, a firm's performance is based on its unique capabilities (i.e., resources) and its competitors' difficulty in imitating them. By reviewing the particular complementary business resources, we may be better able to understand how such resources can provide competitiveness. For example, relationships take time to establish, are thus difficult to imitate.

Implications for Researchers

This research provided an expanded understanding of the resource-based view of the firm. It emphasized the importance of complementary business resources and the lack of importance of complementary human resources. It also demonstrated the importance of e-commerce technology resources, but only in terms of their ability to predict e-commerce performance and benefits.

Because the human resources dimension did not predict any measure of firm competitiveness, perhaps researchers should examine its items more closely. Perhaps the wording of them could be improved, or additional resources themselves be studied. Perhaps particular skills (such as specific managerial or technical skills) might be an important human resource.

The current research found that e-commerce technology resources and business resources predict e-commerce success. But what predict the adoption of e-commerce technology and business resources? Future research might investigate that question.

Future research should look more closely at the resources to see if they individually predict firm competitiveness. Future research might also consider the impact of resources on one another. For example, how do e-commerce technology resources affect such human resources as organizational culture, trust, and top management involvement?

The current research examined the resource-based view of the firm. That view of the firm, in part, emerged in response to the strategic theories of Michael Porter. Porter had suggested that business performance is the result of the use of strategies, the competitive forces, and value chain analysis. Future research could examine e-commerce in such a context, and compare and contrast findings with the findings of the current research. In other words, do Porter's theories or does the resource-based view better predict performance among e-commerce retailers?

Implications for Managers

The failure of e-commerce technology resources to predict overall firm performance while business resources did predict it might support the suggestion that e-commerce technology resources are imitable whereas business resources are not. The implication could be that organizations should make diligent efforts to protect their e-commerce technology resources from imitation as best they can.

This research found that human resources failed to predict firm competitiveness using any of the three measures. Perhaps this striking finding is due to the high employee turnover of e-commerce technology professionals. Still, the casual observer's response might be to disregard human resources in efforts to improve competitiveness. Such a response is quite likely premature. Organizations should still look closely at the role of those resources in e-commerce activities.

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