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The Use of Strategic Forces to Understand Competitive Advantages Provided by Information Technology

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ABSTRACT

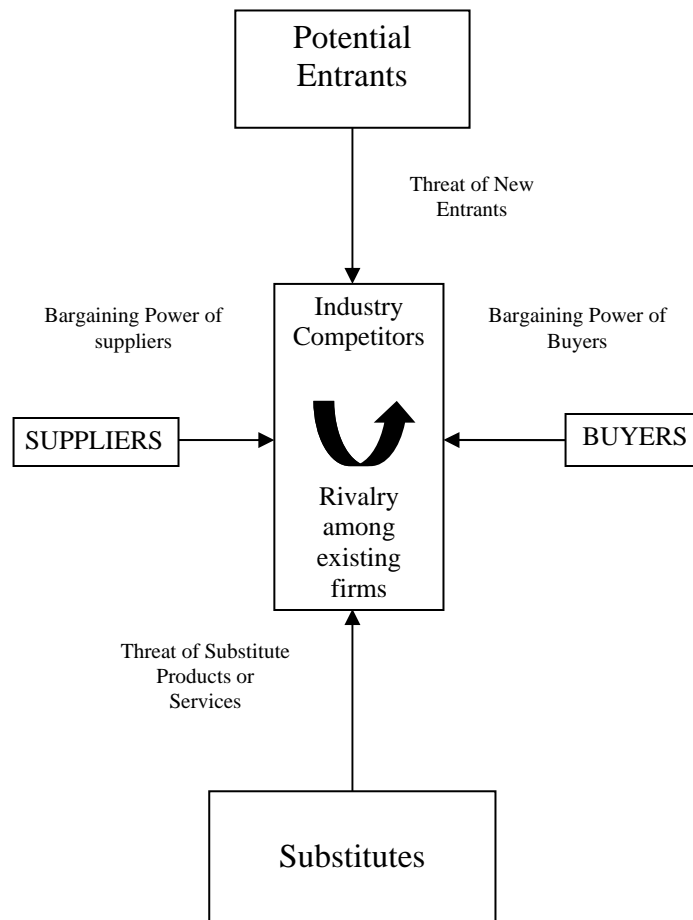
Porter's Five Forces model of business strategy is foundational to understanding strategic forces and the role of information technology in the larger strategic framework of an organization. The authors describe how information technology changes the strength and/or influence of the competitive forces in Porter's model. Furthermore, understanding how specific technologies potentially change specific forces within Porter's model is the foundation of IT strategy. This theoretical framework of strategic alignment is developed through cases demonstrating how specific technologies change the strategic forces within specific industries and how organizations should take advantage of these changing forces. Empirical evidence for the validity of this approach is established through interviews in 136 businesses. Results indicate the utility of Porter's model as applied to strategic information technology was affirmed. Specific findings revealed how current technologies are impacting the competitive landscape.

INTRODUCTION

The foundation for much of the research in strategic information technology is the theory of strategic alignment developed by Henderson and Venkatramen (1989). Called the strategic alignment model (SAM), this theoretical foundation makes a distinction between externally-focused IT (IT strategy) and internally-focused systems (IT infrastructure and processes). These two distinct foci necessitate the integration of IT with both business strategy and operations. It is the integration of IT with business strategy (Jitpaiboom et. Al., 2006) that results in strategic alignment and thus, by extension, in competitive advantage. Integration should be a planned process of the type recommended by Newkirk, Lederer and Srinivasan (2003) in contrast to the evolutionary process suggested by Peters, Heng, and Vet (2002). We propose strategic alignment should be understood and implemented in terms of the impact of IT on the influence and strength of the forces in Porter's Five Forces Model (1979).

Porter's Five Forces Model

Porter's Five Forces model is often used as a tool for analyzing industries and competitive structures within them. The model's central tenet is that an industry's profit potential is determined to a large extent by either one or a combination of five competitive forces within that industry. These forces are: the threat of new entrants, the bargaining power of customers, the bargaining power of suppliers, the threat of substitute products or services, and the intensity of competition among current rivals within the industry. Figure 1 shows the conventional portrayal of this model.

Figure 1: Conventional Portrayal of Porter's Five Forces Model.

Applied to American business, Porter's model reveals numerous examples of the power and threats resulting from each of these forces. For example, in many industries, it is very difficult for new entrants to penetrate the market because of high capital costs, strong equity of existing brands, or distribution channels that are controlled by existing rivals. Specifically, it is very difficult to start a new auto company because of the high capital costs, to pioneer a new soft drink due to strong brands like Coke and Pepsi, or to compete against Anheuser Busch with its control over distribution. Customers and suppliers also can influence companies within an industry by exerting pressure on prices, quality, or the quantity of a product they demand or sell.

The power of suppliers is evident when a small number of suppliers dominate an industry that is highly fragmented, as is the case with Microsoft and Intel, which dominate the highly-fragmented PC industry. These suppliers of key components dictate price, terms, and quantities of operating systems and CPUs. The result is a PC industry that is far less profitable than the suppliers of critical components like Microsoft and Intel.

Suppliers also gain power when the supplied components are highly differentiated making switching from one supplier to another difficult. Suppliers also gain power when there are few substitutes for a component as is the case with CPUs.

Buyers have increased power in an industry when they are small in number and/or they buy in large volume. This is exemplified by the feed grain market dominated by a few large buyers like Cargill and ConAgra purchasing in very large volume. Coupled with a large, fragmented group of sellers (farmers), these buyers dominate the price structure. Similarly, the power of buyers increase when the product is undifferentiated, as is the case in commodities. This allows the buyer to switch from one supplier to another with relative ease. When a buyer purchases in large volume from a supplier, that buyer can account for a sizable portion of the supplier's revenue thus having more power in the

transaction.

Substitute products and services are an increasing threat in the U.S. economy as a greater portion of economic activity occurs as a result of discretionary spending. We see many substitutes in entertainment, leisure, recreation, and fitness. Each gains power if it offers better price-performance relative to the industry average. Now, a pay-per-view movie is cheaper than going to the movie theater, and in-home workout equipment is far less expensive than health club memberships. Power also increases when the substitute product or service is produced by a supplier with "deep pockets," as may be the case when media companies are owned by large manufacturing conglomerates like GE (Lea, 2005).

The fifth force in Porter's model is rivalry among existing participants. Here we see the intensity of the rivalry increasing when competitors are large in number and equivalent in size and power. This tends to lower prices and margins and is evident in many retail sectors. Rivalries are also intense in mature industries where competition is more about shifting market share than creating new customers. Autos, heavy equipment, petrochemicals and airlines serve as examples.

A THEORY OF STRATEGIC ALIGNMENT

Strategic alignment has two major tenets. First, IT strategy must be focused on external competitiveness, rather than on internal operations. This is a significant contribution of the original strategic alignment model as presented by Henderson and Venkatramen (1989). Second, IT influences competitive advantage as it alters the direction or strength of one or more of the forces in Porter's model. The competitive dynamics of industries change as new technologies and their application change the power of buyers, suppliers, new entrants, substitute products and existing rivals (see Sasidharan et. al., 2006). What follows is an expansion of each of these key components.

External versus Internal Focus

A firm's strategy must be focused on gaining sustainable competitive advantage. Consequently, the focus within corporations on business unit strategy is on the external industry forces discussed previously. For IT strategy to be aligned with business unit strategy, it must be focused on external forces and the sustained competitive advantage this focus provides. Since IT has traditionally been focused on operations and data processing (i.e. internal matters), the debate is whether an internal focus on infrastructure and processes can ever lead to competitive advantage.

IT infrastructure and processes tend to support efficiency: lower costs, faster transactions, higher quality, and production efficiency. The question, then, is whether these efficiencies can result in sustained competitive advantage. The key word here is "sustained." There is little question that internally-focused IT can produce competitive advantage, usually from being a "first-mover" or early adopter of a technology. The problem is that this advantage is short-lived. The primary reason internally-focused technologies do not lead to sustained competitive advantage is that the technologies employed are supplied by vendors (Evans, 1995) selling to all rivals within an industry. This makes these technologies tactical rather than strategic; focused on operational efficiency rather than sustained competitiveness.

Strategic Technology and the Five Forces

The central part of our theory of strategic alignment is that technology, in order to be strategic, must alter the direction or strength of the forces within Porter's Five Forces model. Since this concept of strategic thinking considers a firm's position within an industry relative to the five forces, it follows that strategic technologies must influence one or more of these forces to the advantage of a firm. This approach is valuable in that it provides direction for which technologies to adopt, maintain, and support in order to achieve sustained competitive advantage (Lee, Niu & Ho, 2007).

A technology that makes it easier for new firms to enter an industry obviously changes the competitive nature of that industry. Recently we have seen how internet technology has allowed a number of e-tailers to enter various segments of the retail market. Amazon, e-Bay, and Price Line are three of dozens of examples of new entrants into industries which--prior to the internet--were difficult to enter on a national scale. Likewise, cellular technology has

given rise to entirely new telecommunications firms in an industry that previously had a limited number of rivals. In the aforementioned examples, new technology decreased the barriers to entry.

Conversely, other technologies have increased the barriers to entry in certain industries. Many specialty suppliers within complex supply chains use database and telecommunications technology to strengthen their relationships with parent firms, thereby making it difficult for rivals to break into the supply chain.

The bargaining power of suppliers is decreased by any technology capable of increasing the number of suppliers. An example of this phenomenon would be how eBay has transitioned into a B2B marketplace, making a much broader range of suppliers available for items like computers, office supplies and equipment.

Technologies that increase switching costs increase the power of suppliers, while those that decrease switching costs decrease the power of suppliers. Amazon's technology to track consumer purchases and recommend products based on past purchases may make customers reluctant to switch to other vendors. Likewise, flexible manufacturing technologies that allow for high levels of product customization tend to make it less attractive for customers to switch to a rival's product or service. Looking at an example where technology lowers rather than raises switching costs, the Windows operating system has made the difficulty of switching from one PC maker to another almost negligible.

The bargaining power of buyers is influenced by a number of similar factors. As the number of buyers of a product or service increases, the bargaining power of any individual buyer decreases. On the down-stream side, internet technology has increased the pool of potential buyers of many products and services, thereby decreasing their power as individual buyers while increasing the power of the sellers. Similarly, auction sites like e-Bay pit one buyer against another in an attempt to increase the price. Conversely, on the up-stream side, supply chain technology may limit the number of suppliers who have access to secure networks, thus making them captive to the buyer. This situation increases the bargaining power of the buyer while limiting that of the suppliers. In reality, when an up-stream supply chain is set up and controlled by a major manufacturer, most of the bargaining power is held by the manufacturer. This technology-facilitated lock-in is now being extended to labor markets where both large and small firms can outsource their labor to contract suppliers who later end up having little bargaining power relative to the parent firm.

Substitute products are increasing their importance as a strategic force. The networked economy, enabled by a broad range of telecommunications and transportation technologies, makes substitute products and services an increased threat to firms in many industries. This is particularly true as a larger portion of GDP becomes discretionary spending. On-line video gaming is a substitute for more traditional television programming. Likewise, fantasy sports leagues are becoming substitutes for spectator sports. On-line health and medical sites often substitute for visits to medical practitioners.

While the quality of these substitutes is debatable, it is nonetheless true that these emerging technologies result in the distinct possibility that a firm's principal competition may now be a rival in a completely different industry.

Within an industry, it is almost inevitable that rivals will use the same core technology for the production of their products and services. In most instances, these core technologies will be supplied by vendors of machine tools, computer and information technology, transportation equipment, and building infrastructure. All such technologies transfer very rapidly among the rivals within an industry. As a result, most core technology within an industry is tactical, rather than strategic. For example, all the transportation companies use the same airplanes, locomotives, and trucks. Manufacturers use the same milling machines, welding robots and conveyors. Banks use the same database systems to track customers and accounts as do insurance companies.

Even when a new application of a technology is introduced, the competitive advantage gained by a single firm is short-lived. Although Fed Ex pioneered the package tracking system, it was quickly duplicated by UPS and other parcel delivery companies. Thus, core technologies, initially thought perhaps to be strategic, rapidly become tactical technologies as the technology transfers among rivals within an industry.

Among rivals, sustained competitive advantage derived from technology usually occurs when the technology is maximized by innovative organization structures, marketing channels, or supplier relationships. Dell Computer has

taken widely-available internet and supply chain technology and leveraged it into a sustained competitive position in the PC industry. The company has done this by limiting its marketing channel to direct sales, co-locating supplier facilities, and adopting a made-to-order.

METHODOLOGY

Sample and Methods

To validate this model of competitive technology, personal interviews were conducted in 136 businesses geographically distributed across the inland northwest of the United States from Washington, Idaho and Montana. Businesses were selected randomly from regional telephone directories. Initial telephone calls were used to determine whether an owner or manager was available to answer questions. Then, a trained interviewer met with the owner or manager in a face-to-face interview. The interviews were conducted between September 2005 and May 2006 with the owner or top manager of the business responding in person. An extensive questionnaire was used to insure that the interview format and information gathered was consistent across all businesses. The questionnaire included a copy of Porter's Five-Force model, which was explained to the interviewee. Additionally, the process allowed each business to identify five information technologies that were in use in their industry to ascertain the competitive potential within the context of a specific industry and business. Answer to the interview questions were recorded on a paper copy of the interview. The answers to the actual questions will be summarized in the following pages.

The first questions on the interview concerned the type and size of the business as presented in Charts 1 and 2.

Chart 1: Business Type.

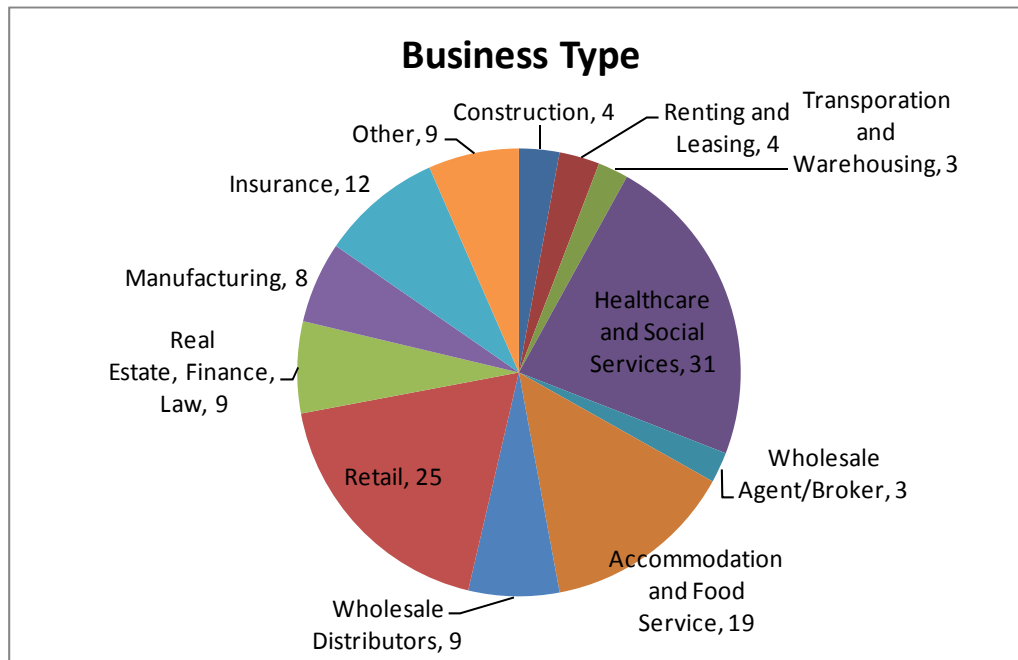
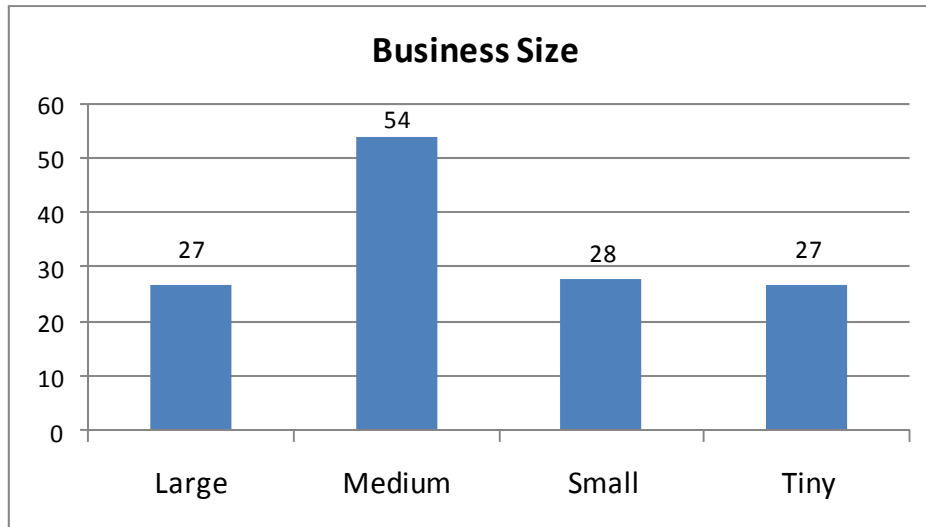


Chart 2: Business Size.



The data in Charts 1 and 2 demonstrate that our sample provided a diverse cross section of business types and sizes. The lack of stratification and resulting under-representation of some types of businesses makes generalization of these results to the entire population of business problematic. However, the sample is certainly sufficient for analyzing the validity and usefulness of the model. The categories for business size were: large (over 500 employees); medium (100-499 employees); small (15-99 employees); and tiny (less than 15 employees).

Technologies reported as being widely used by a majority of the respondents in their industry included database technologies, point of purchase systems, in-bound and out-bound supply chain management systems, accounting information systems and management information systems. Technologies reported as being used by less than half of the respondents for business operations in their industries included customer relationship management systems, decision support systems, and e-commerce systems.

Although the purpose of the research was to validate the model, one interesting result was that smaller businesses tended to report wide-spread use of more transaction processing systems like database management systems, accounting information systems, and point of purchase systems. Larger business tended to report more wide spread use of decision support systems, management information systems, and supply chain management systems.

The most widely used technologies were labeled as “industry specific” technologies. These included the above-cited general information technologies that were customized for a specific industry. For example, materials requirements management parts explosions were widely used by automobile repair shops; healthcare records systems were widely used by clinics and professional offices; and package/shipment tracking systems were reported by wholesaler and transportation firms.

The purpose of the information gathered about specific types of information technology was not to understand the technology being used but rather to provide the respondents with a clear context within which to report the competitive potential of information technology in their business and industry. Furthermore, requiring respondents to identify specific technologies forced them to judge more clearly the usefulness of Porter’s model in describing the competitive potential of information technology.

RESULTS

The most important question posed for the owners or managers of the businesses in this sample was whether Porter’s Five-Force model contributed to their understanding of the competitive advantage provided by information technology. A five-point scale was constructed. The labels were: (1) “no contribution,” (2) “slight contribution”,

(3) “moderate contribution”, (4) “high contribution”, and (5) “very high contribution.” Chart 3 presents the frequency distribution of responses.

Chart 3: Porter’s Model Contributes to Understanding.

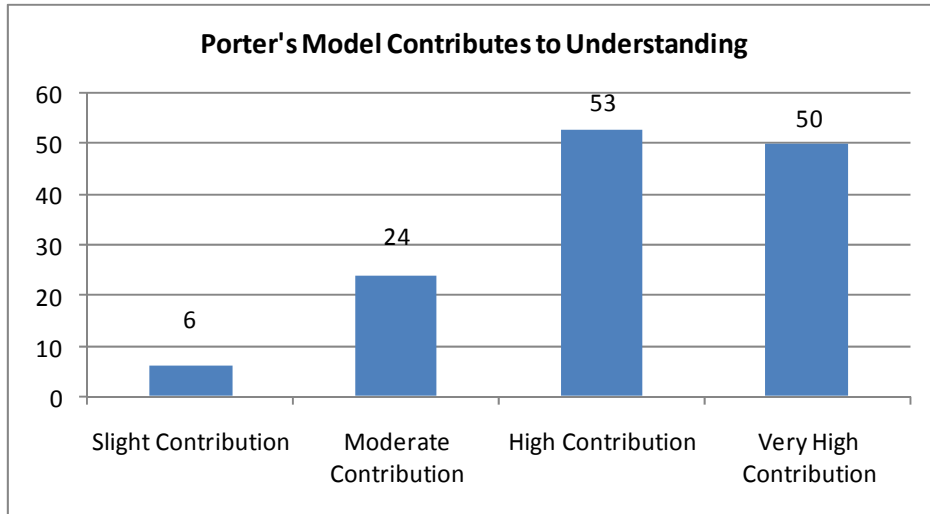


Chart 3 demonstrates that over 75% of the respondents believed Porter’s Five Force model to make a high or very high contribution to their understanding of the competitive potential of information technology in their industry.

Beyond the actual answers to this question, the most frequent comment concerned the necessity to adopt industry specific systems not for any hope of competitive advantage, but to merely keep up with the industry. Small grocery stores had to install POP scanners not to gain competitive advantage but to simplify the training of employees in high-turnover positions. Auto repair facilities had to use parts databases not to gain a competitive edge but because suppliers required them as part of the ordering process.

In addition to the broad question about the contribution to understanding of Porter’s model, the respondents were asked a series of question about how specific technologies impacted each of Porter’s Five Forces. First, they were asked to focus on two of the previously-identified technologies widely regarded as contributing to competitive advantage in their industry. The actual technologies identified by each interviewee of course varied from business to business. Then they were asked to evaluate the competitive impact of those technologies in regard to rivalry among existing businesses in their industry. Charts 4 and 5 display the results.

Chart 4: Competitive Potential of Tech 1.

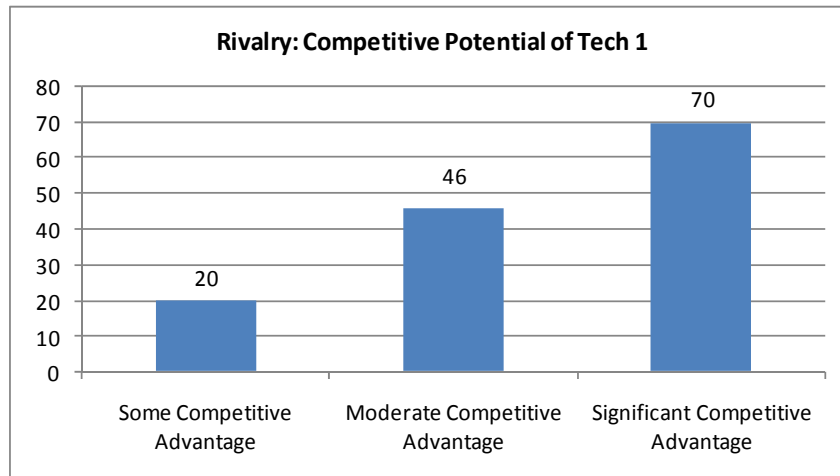
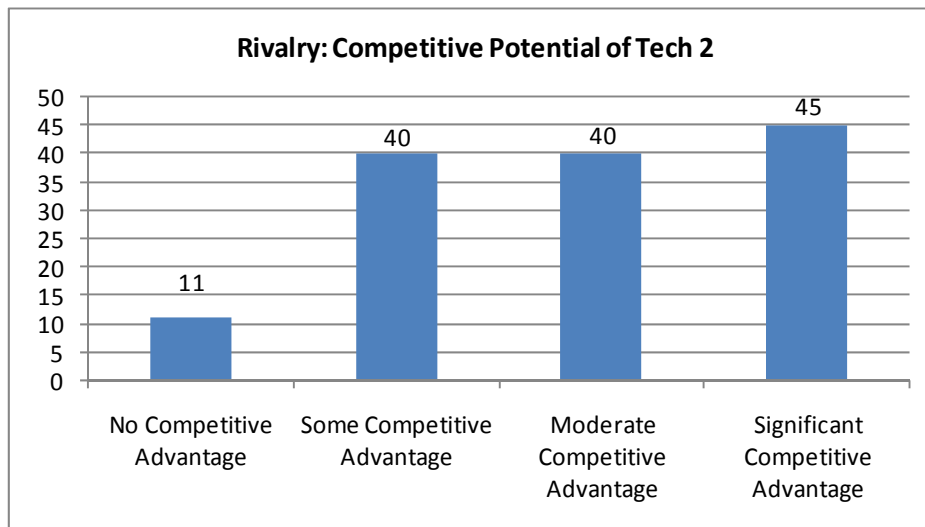


Chart 5: Competitive Potential of Tech 2.



As shown, Charts 4 and 5 demonstrate that business owners and managers are able to identify technologies that either contribute to competitive advantage over rivals or do not contribute to such advantage. Of those respondents who cited “significant competitive advantage,” the systems they were referencing included self-checkout for retail businesses, inbound and outbound supply chain management systems for wholesales and manufacturers, on-line access to credit report information for financial institutions, and internet-based selling for boutique retailers. The important result for validating the model is not the specific technologies that led to competitive advantage, but rather it is the fact that owners and managers could use the model effectively to evaluate technologies for their competitive potential.

Next, respondents were again asked to focus on one of the previously-identified, important technologies in their industry. They were then asked to determine whether this technology made substitute products or services more or less attractive. The responses are displayed in Charts 6 and 7.

Chart 6: Less Attractive.

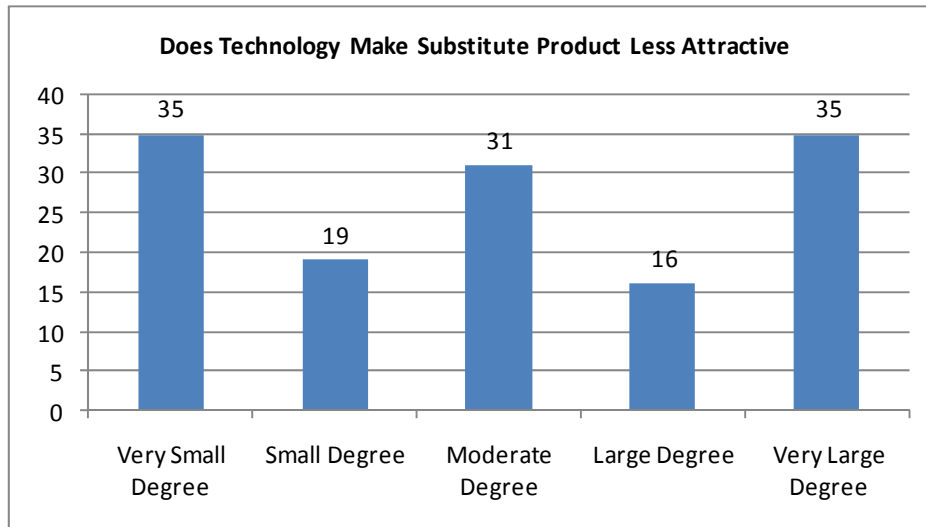
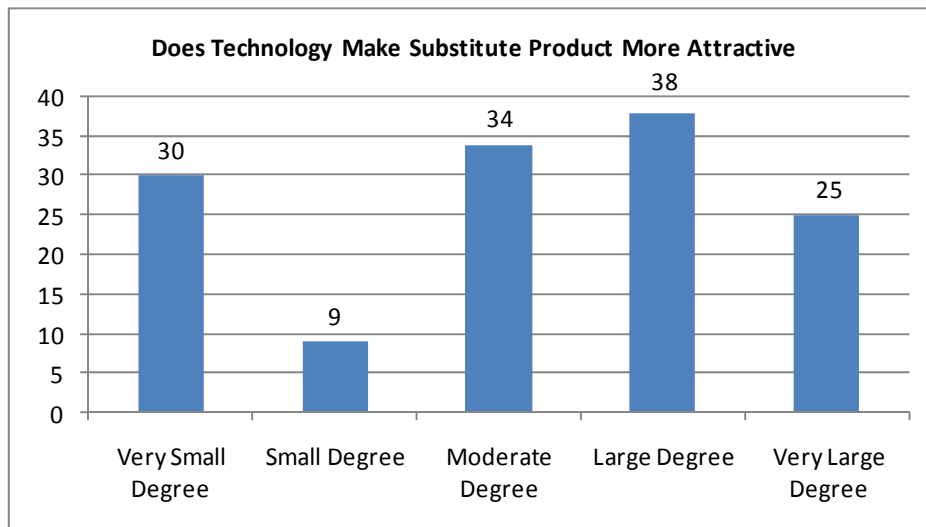


Chart 7: More Attractive.



The interesting observation about these results is the somewhat uniform distribution of responses in both Chart 6 and Chart 7. Business owners and managers were able to evaluate technologies relative to how attractive or unattractive the technology made substitute products. Some technologies, such as internet retailing technologies, made substitute products and services more attractive. On the other hand, supply chain management technology had very little impact on the attractiveness of substitutes since these technologies tend to lock a business into specific suppliers. Again, the important point is not which technologies made substitutes more attractive or less attractive but that respondents were able to apply the model to evaluate technologies.

The third of Porter's Five Forces examined here was the degree to which technology was able to raise or lower barriers to new businesses entering the industry (Charts 8 and 9 display these results).

Chart 8: Create Barriers to Entry.

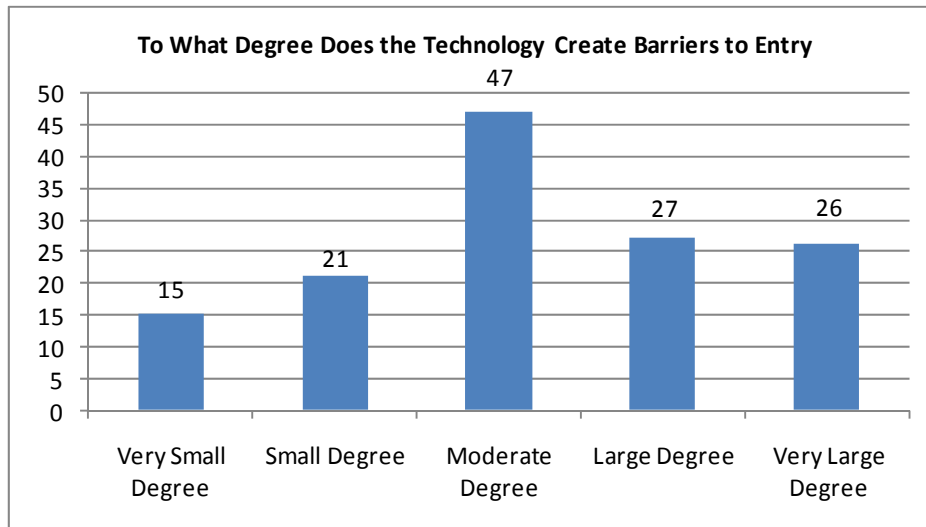
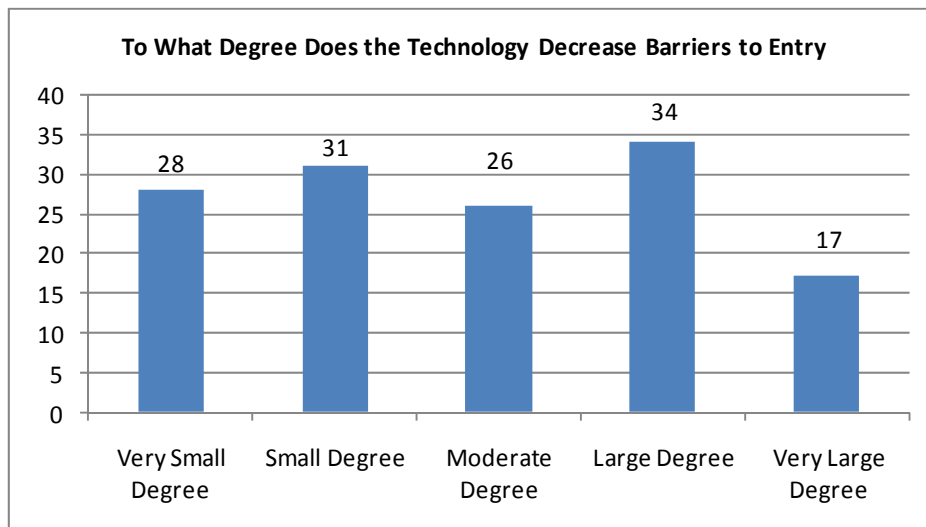


Chart 9: Decrease Barriers to Entry.



Charts 8 and 9 demonstrate an even distribution among technologies that lower or raise the barriers to enter an industry. This provides some evidence that the respondents were using Porter’s model in a meaningful way since the a-priori assumption would be that some technologies raise the barriers to entry and some technologies lower those barriers. Given a randomly selected sample of businesses and technologies, one would expect an approximately uniform distribution of responses.

The next four charts display the responses to questions about changes in the power of suppliers and buyers, the fourth and fifth of Porter’s Five Forces. These included the degree to which technology decreases supplier power (Chart 10), the degree to which it increases supplier power (Chart 11), the degree to which technology decreases buyer power (Chart 12), and the degree to which technology increases buyer power (Chart 13). As with technologies that alter the barriers to entry, one would expect that some technologies were increase and decrease the power of buyers and suppliers.

Chart 10: Decrease Supplier Power.

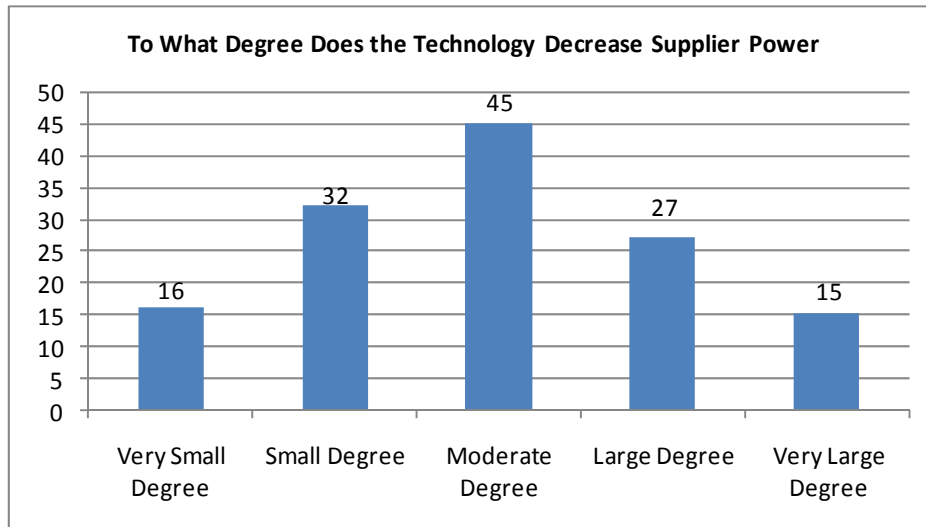


Chart 11: Increase Supplier Power.

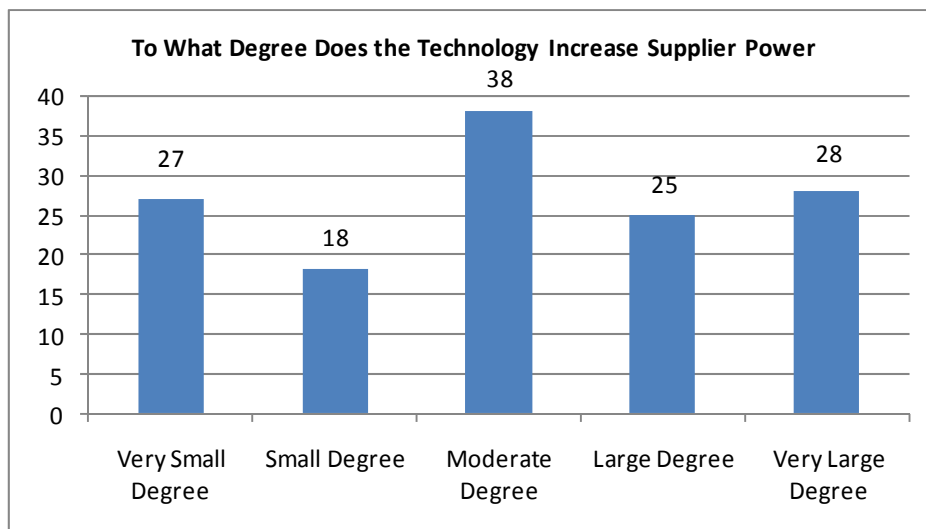


Chart 12: Decrease Buyer Power.

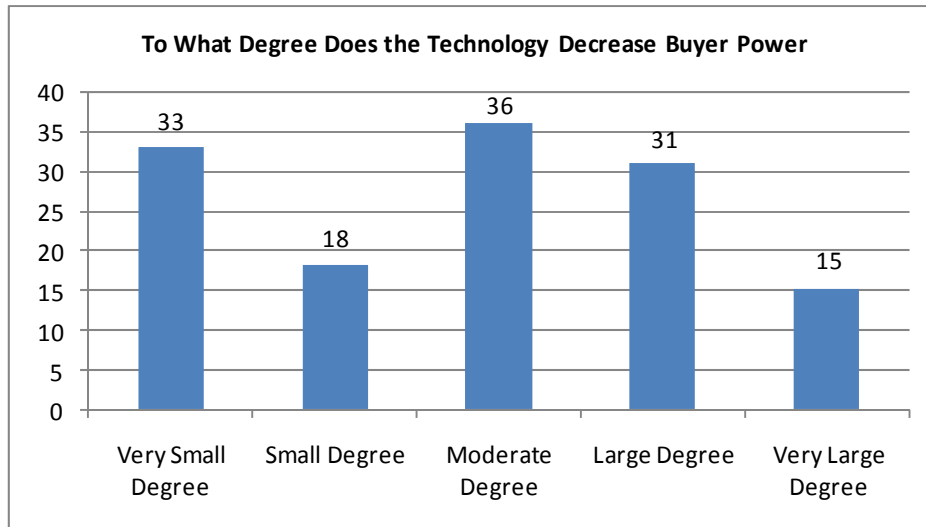
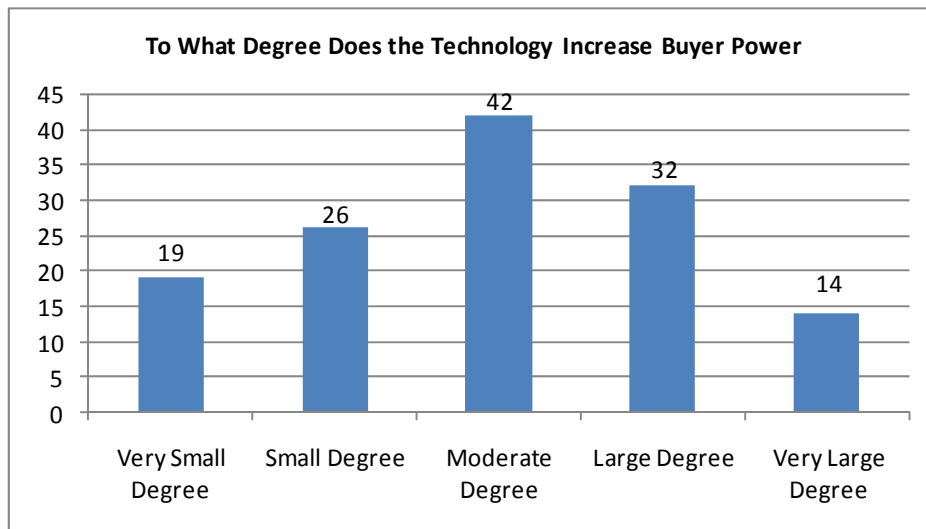


Chart 13: Increase Buyer Power.



As the aforementioned four tables indicate, some technologies increase the power of suppliers and others decrease the power of suppliers. Similarly, some technologies increase the power of buyers, while others decrease that power. Fortunately, as this research established, business owners and managers appear quite capable of making determinations about the competitive nature of information technology, asserting with confidence their perceptions of shifts in competitive power.

CONCLUSIONS

The results of this study are encouraging insofar as they provide validation to a model postulating that Porter’s Five Forces provides a useful construct to understand IT strategy. Moreover, business owners and managers were adept at using Porter’s Five Forces as a tool to evaluate the competitive potential of specific information technologies used in their industries. Subsequent investigations into which specific technologies were perceived as providing specific kinds of competitive advantages within each industry are logical extensions of this research. They would be predicated upon this initial investigation which established the validity of model application.

We can assert with some confidence that business owners and managers used Porter's model effectively because they were able to readily determine whether a specific technology provided or did not provide competitive advantage. Furthermore, these respondents were able to determine whether an identified technology raised or lowered barriers to entry, made substitutes more or less attractive and increased or decreased the power of buyers and suppliers. Among the array of technologies within an industry, some were perceived as creating competitive advantages and others were perceived as not providing any advantages. This clear discernment indicates business owners and managers are analytical and unambiguous when evaluating whether technologies contribute or fail to contribute to their businesses' competitive positions.

Clearly, there is a pro-active role for this application of this model involving Porter's Five Forces as conceptual framework within which to evaluate technology. If utilized prior to adopting specific technologies it would ensure that such investment decisions are more focused on organizational strategy and competitiveness. In the course of the interview, some respondents commented that the conceptual framework would have been useful in identifying technologies that were adopted to gain competitive advantage only to discover after adoption that the universal use of the technology within the industry severely limited its competitive potential. Point of purchase systems are good examples of this situation. Additionally, some respondents adopted up-stream supply chain management systems thinking it would provide them with a competitive edge. What they discovered after adoption was that the technology merely locked them into a narrower group of suppliers thus limiting their power as a purchaser.

Finally, these results establish unequivocally that technology is having a very broad impact on the competitive dynamics within a wide range of industries. In sum, each of Porter's Five Forces was impacted in various ways by the technologies represented in this study; no single technology or competitive force emerged as the definitive locus of advantage or disadvantage. This finding indicates there are many opportunities for creating organizational value and competitiveness from technology. Ironically, it also indicates there is great opportunity for wasting resources on tactical technology erroneously considered strategic technology prior to adoption without the analysis of this model. Therefore, the use of this model can help decision makers allocate resources more effectively, thereby enabling them to focus on technologies chosen to alter the competitive forces to their advantage.

DISCUSSION

Our original proposition held that unlike tactical technologies that provide for operational efficiency, strategic technologies disrupt the competitive forces within an industry. We noted how a disruption that is easily duplicated results in temporary competitive advantage, while a disruption of competitive forces that is difficult to duplicate results in more sustained competitive advantage. This can be seen for example, as when IT-based affiliation of suppliers in a supply chain potentially precludes a competing firm from affiliating with the same group of suppliers. When Dell was able to persuade suppliers of PC components to co-locate with Dell in Austin, Texas, this precluded these suppliers from co-locating with other PC makers due to capacity constraints (Magretta, 1998).

There are other mitigating factors in supply chain relationships worthy of note. Loyalty plays a role. Once a customer has provided a seller with detailed information about such things as personal book preferences, credit card number, and buying habits, s/he is less likely to provide similar information to a competing book seller. Thus, a company like Amazon uses its technology in this manner for competitive advantage.

We also noted earlier, that strategic technology becomes tactical technology quickly as it transfers to all members of a competitive rivalry. Unfortunately, this makes any first-mover advantage temporary at best. Still, there are examples of sustained competitive advantage where non-proprietary disruptive technology has been combined with other organizational factors. For example, Toyota employs manufacturing technology effectively, but it also combines these technologies with strong branding, innovative product design, and superior customer relationship management. The result has been consistent competitive advantage and growth in market share.

Wainwright and Waring (2004) asserted that organizational and managerial structures create a synergy with IT to create unique sustained competitive advantage. Consider how the technologies employed by Dell are easily duplicated. What is not easily duplicated, however, are these technologies coupled with a direct-to-consumer supply chain built from the ground up, a just-in-time manufacturing system based on a closely-affiliated supply chain, and a human resources strategy designed specifically to support this innovative business model. As Dell has

demonstrated, it is this continuous refinement and reengineering of the organization, coupled with the strategic technology, which provides for more sustained competitive advantage (Beard & Sumner, 2004).

Perhaps strategic “alignment” is too weak a term to describe the relationship between IT and strategy. “Integration” may better capture the essence of this concept (Weill & Broadbent, 1998; Evgeniou, 2002). As IT is fully integrated into both the strategic plan and the processes of an organization, all five of Porter’s forces can be utilized for sustained competitive advantage.

Finally, it is important to note that neither competitive advantage gained through the application of strategic IT nor, that derived from IT in concert with complementary organization structures and managerial practices should ever remain static (Salmela a Spil, 2002). Indeed, the nature of competition dictates that those behind strive to catch up by imitating the most successful, hoping to leap ahead. To stay competitive, organizations must continually implement technologies capable of influencing strategic forces to their benefit. This drive termed “IS capability” by Peppard and Ward (2004) captures the concept of organizational value and competitiveness leveraged through the application of strategic IT. But, that is not enough. Businesses must also adopt the organizational and managerial practices supporting those technologies. As this study revealed, IT strategy, when integrated with business strategy, is a process of continually examining the competitive forces in the industry and then leveraging these forces for competitive advantage. The model presented here provides business owners with a tool with which to evaluate technology adoption decisions in the light of competitive potential. Understanding competitive forces and how specific technologies can impact them is key to making decision on which technologies to adopt and critical to having realistic expectation on the potential competitive advantage of specific technologies.

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