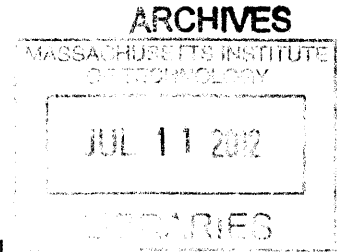


**Information Technology and Sustained Competitive Advantage:
A Research Model for the effect of Information Technology on
Sustained Competitive Advantage and an empirical analysis**

By

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B.E., Computer Engineering, Pune University, India, 2004



Submitted to the System Design and Management Program in Partial Fulfillment of
the Requirements for the Degree of

Master of Science in Engineering and Management

at the

Massachusetts Institute of Technology

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Information Technology and Sustained Competitive Advantage:

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By: Sarvesh P. Saodekar

Submitted to the System Design and Management Program on May, 2012 in Partial Fulfillment of the Requirements for the Degree of Master of Science in Engineering and Management

Abstract

Companies consider Information Technology (IT) to be a major factor for achieving sustained competitive advantage (SCA). The effect of IT on firm performance has been studied from two main perspectives: the market based perspective and the resource based view. The market based perspective emphasises market structure as the primary cause of a company's strategy and the resource based view builds on the concept of an enterprise as a bundle of unique resources. In this thesis, the effect of IT on SCA is studied from these two theoretical frameworks and an integrated research model is proposed. This model considers contribution of IT factors: IT assets, IT capabilities and IT strategies towards SCA. An empirical analysis of the SCA research model has been done through surveys. The results of this analysis do validate some literature based findings but do not provide statistical evidence of any IT factors leading to SCA.

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Information Technology and Sustained Competitive Advantage: A research model for the effect of IT on SCA and an empirical analysis

Chapter 1. Introduction

The importance of Information Technology (IT) in organization has long been the focus of research and one area which is extensively covered is effect of IT on company's strategy and performance. The impact of IT on company's performance is widely accepted and the successful implementation of IT is linked with improvement in company's performance and its competitive position (Dehning & Stratopoulos, 2003). This impact has been mainly studied from two main approaches: the market driven perspective and the resource based view of the firm. Researchers have also developed other integrated frameworks that are based on both market driven and resource based views (Rivard, Raymond, & Verreault, 2004) and classified IT-enabled strategies based on these various frameworks.

A market based approach suggests that a firm is concerned more about market environment in which it is operating. Companies can achieve competitive advantage by creating value for its customers through low-cost, customer focused, and differentiation strategies. A resource based approach places more emphasis on the firm's assets and capabilities. It attributes better firm performance and sustained competitive advantage to IT assets and capabilities that are heterogeneously distributed and difficult to imitate. These IT-enabled strategies, IT capabilities

and IT assets are used by companies to enhance their performance, gain competitive position in the market and maintain their competitive position for longer duration, i.e., attain sustained competitive advantage (SCA).

Some research, however, suggests that IT does not have any significant impact (Carr, 2003) or has failed to establish a link between IT and company's performance (Strassman, 1997) (Kohli & Grover, 2008). A possible reason might be the easy duplication of IT related systems by competing firms which can nullify the competitive advantage. In some cases, due to easy availability and faster implementation of IT systems, the competitive advantage even if it exists, lasts for very short duration.

This paper examines the effect of IT on SCA. The objective of this study is to build upon the two different perspectives (market based view and resource based view) to improve our understanding of contribution of IT to SCA. To calculate the effect of IT, different IT-enabled strategies, IT capabilities and IT assets are considered. This paper proposes a research framework based on theoretical studies and this framework has also been evaluated through empirical evidence in this paper. The paper is organized as follows:

- A. Discussion about sustained competitive advantage
- B. An overview of general strategic frameworks like competitive forces (Porter M. , 1980) (Porter & Millar, 1985), resource based view and composite model (Spanos & Lioukas, 2001) along with their IT based models like resource based view for IT (RBVT) (Bharadwaj, 2000), and composite model for IT (Rivard, Raymond, & Verreault, 2004).
- C. Discussion of IT enabled strategies for competitive advantage
 - o Low Cost

- Differentiation
- Customer Intimacy
- D. Discussion of IT capabilities
 - IT technical skills
 - IT business skills
- E. Discussion of IT assets
 - a. Access to capital
 - b. IT infrastructure
- F. Development of conceptual research model: **Sustained Competitive Advantage Model**
which explores relationship between SCA and IT enabled strategies, IT capabilities and IT assets.
- G. Development and testing of hypotheses developed via the research framework.
- H. Description of the methods used for survey development and model testing.
- I. Documentation of results, i.e. IT based initiatives that we believe through our findings
which are source of SCA for firms, and
- J. Discussion of limitations and future research.

Chapter 2. Information Technology for Sustained Competitive Advantage

Information Technology (IT) provides value to the company but the quantitative influence of IT on sustained competitive advantage (SCA) remains elusive. This chapter defines the SCA and discusses IT enabled strategies, IT capabilities and IT assets which are believed to affect firm strategy and performance. These IT enabled strategies, capabilities and assets are explored and discussed from widely accepted and researched generic strategic framework perspectives like competitive forces, resource based view and composite model. The chapter provides overview of these frameworks along with their IT counterparts from the Information Systems literature also.

Sustained Competitive Advantage

Competitive advantage is defined as the strategic advantage one business entity has over its rival entities within its competitive industry¹. The firm in a competitive advantage position has higher profitability than other firms in the same industry. Generally, the competitive advantage is gained by offering consumers greater value, either by lowering prices or by providing greater benefits and services that exceed those of competing products. The main aim of these strategies is to offer the customer lower prices or a higher quality product than competitors. The strategies that cannot be imitated by other rivals are considered to be the strongest competitive advantage for that firm. Firms strive to acquire or develop an attribute or combination of attributes that provide an advantage over its competitors. These attributes can be firm assets, capabilities, or even strategies. As shown in Figure 1, competitive advantage for a firm is achieved from activities that span across four domains (Rindova & Fombrun, 1999).

¹ Source: http://en.wikipedia.org/wiki/Competitive_advantage

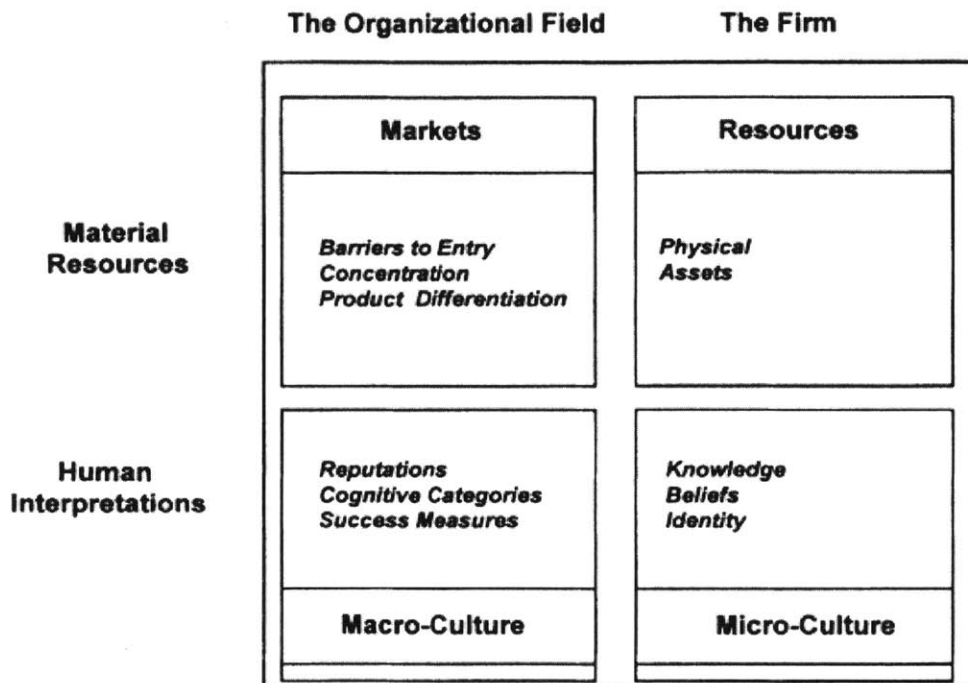


Figure 1 Sources of Competitive Advantage

Source (Rindova & Fombrun, 1999)

In this figure, the Y axis dimension divides the competitive advantage terrain into resource based and market based domains of actions, while the second dimension divides the terrain into material resources and human interpretations.

Very few competitive advantages can be sustained for a long length of time since there is possibility of duplication of those competitive advantages by competing firms. This may be due to increase in perceived attractiveness of the industry for competing firms. The increase in attractiveness leads to higher efforts from competing companies to duplicate leader firm's strategies. However, when a firm's strategy enables it to have above-average profitability over longer duration of time it is said to have SCA. SCA is different from competitive advantage because it is a long-term advantage that cannot be easily duplicated. In order to achieve a "sustainable" competitive advantage, firms must provide valuable product or services to the

consumers that cannot be easily imitated or copied by competitors or substituted by another product. These SCA strategies should create products or services that are substantial and sustainable:

Substantial: Products or services are not marginally superior. They should be substantially different.

Sustainable: The products or services' importance does not evaporate or fade away with time, or cannot be easily copied by competitors.

Understanding the sources of SCA has been a major area of strategic management research. The Strength-Weakness-Opportunities-Threat (SWOT) based framework (Barney, Firm Resources and Sustained Competitive Advantage, 1991) (see Figure 2) suggests that firms obtain SCA by structuring strategies by capitalizing on internal strengths, responding to external opportunities, neutralizing threats and avoiding internal weaknesses.

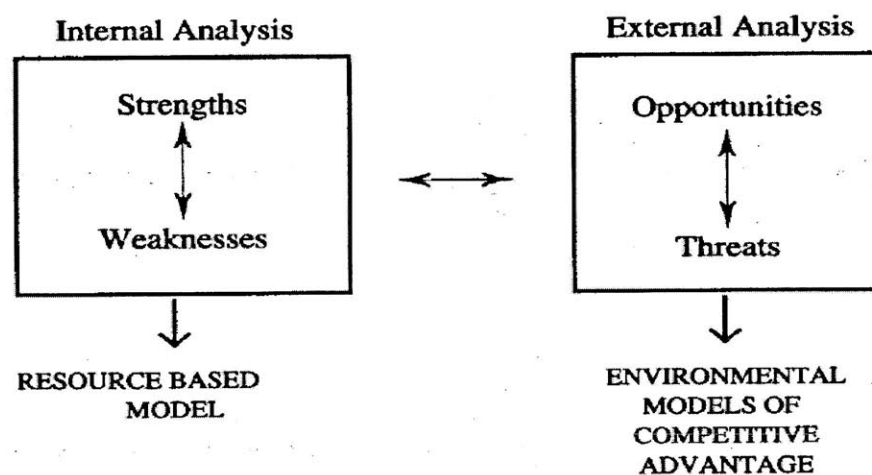


Figure 2 SWOT for Sustained Competitive Advantage

Source (Barney, Firm Resources and Sustained Competitive Advantage, 1991)

An understanding of both the resource based model and the market based model is essential to comprehend which strategies can lead SCA. The market based view emphasizes industry forces and deals with external components of SWOT framework (Opportunities and Threats). The resource based view focuses on a firm's capability to develop and use resources for competitive advantage and deals with the internal components of the SWOT framework (Strengths and Weakness). Once we understand the generic strategies based on these different models, it is imperative to explore IT based initiatives based on these strategies.

Information Technology Enabled Strategies

A strategy is a plan of action designed to achieve a vision. At a higher level we can say that it is approach of doing business. The comprehensive definition as provided by Johnson and Scholes (Johnson & Scholes, 1998) is:

"Strategy is the *direction* and *scope* of an organization over the *long-term*: which achieves *advantage* for the organization through its configuration of *resources* within a challenging *environment*, to meet the needs of *markets* and to fulfill *stakeholder* expectations".

To provide value to stakeholders, the company needs to maximize the use of its resources within the context of the competing environment. Two different widely accepted strategic perspectives that form the crux of strategic management literature address how firms use their resources. These are market based perspective and the resource based view of firm.

Market Based Perspective

Market based perspective emphasise market structure as the primary cause of a company's strategy and performance. Competitive advantage is a result of differential market power which enables dominant firms to control prices. Market-based perspectives talk about industry analysis, competitive positioning and competitive dynamics in the industry.

Industry Analysis contemplates the external environment and tries to give answers to “where, how and when” to compete questions.

Competitive Positioning deals with how a company can defeat other players in industry and can perform better than its peers. It resides on strategies which can put companies in superior position as compared to its competitors. The heart of this phase is to understand how a firm can configure its activities to generate a wider gap between willingness to pay and costs that its competitors achieve. A differentiation strategy and a low-cost strategy are some of the strategies used by companies to gain competitive advantage.

Competitive Dynamics deals with how a firm sustains its competitive dominance. When a company is in dominant position, it can employ strategies like strategic tie-ups, customer intimacy, and emphasis on innovation to come up with innovative, better products.

Porter's Five Forces Framework² (Porter M. , 1980) is a widely used framework for performing an industry analysis (see Figure 3).

² http://en.wikipedia.org/wiki/Porter_five_forces_analysis



Figure 3 Porter's Five Forces Framework

Source Wikipedia Porter's five forces³

The five forces used for industry analysis are

- Bargaining Power of Suppliers
- Bargaining Power of Customers
- Threat of New Entrants
- Threat of Substitute Products
- Competitive Rivalry within an industry

These five forces impact the competitive landscape of company's industry. To achieve better performance, a company should develop its strategy to give it an attractive position compared to its competitors. IT can be used to develop such type of strategies. To use IT for competitive strategy, Parsons (Parsons, 1983) uses above Porter's five forces framework to identify six categories of opportunities for competitive advantage.

- (1) Increase customers switching costs through IT based information or services;

³ http://en.wikipedia.org/wiki/Porter_five_forces_analysis

- (2) Decrease own switching costs against suppliers;
- (3) Use IT to support product innovation for purpose of maintaining one's position or deterring potential substitutes;
- (4) Cooperate through shared IT resources;
- (5) Use of IT for automation to substitute IT for labor; and
- (6) Use of IT products and services to better segment customers and to satisfy them.

Even though Parsons did his research quite a long ago, most of the IT strategies used by companies eventually fall into one of the above mentioned six categories. For example, plant floor automation using IT in large manufacturing companies, falls into the fifth strategy category and use of cloud computing falls into third strategy category.

As mentioned earlier in this section, in this market based view, the main determinants of firms profitability are the attractiveness of the industry in which it is operating and its position in that industry. The five forces framework enables us to gauge the attractiveness of industry and positional strategies enable a company to get competitive advantage in that industry. The combination of low cost and differentiation strategies with scope of firm activities leads to three generic positional strategies (Porter M. , 1998): cost leadership, differentiation and focus. The company implementing focus strategy generally selects a small segment and aligns its strategy to capture value in that specific segment. As shown in following Figure 4, the focus strategy has two variants, cost focus and differentiation focus. In cost focus a firm seeks a cost advantage in

its target segment, while in differentiation focus a firm seeks differentiation in its target segment.

		COMPETITIVE ADVANTAGE	
		Lower Cost	Differentiation
COMPETITIVE SCOPE	Broad Target	1. Cost Leadership	2. Differentiation
	Narrow Target	3A. Cost Focus	3B. Differentiation Focus

Figure 4 Generic Strategies for Competitive Advantage

Source (Porter M. , 1998)

Companies that have taken leadership positions in their industries have delivered superior value to the customer by pursuing one or combination of these three strategies: operational excellence, product leadership or customer intimacy (Treacy & Wiersema, 1993). These three forms the dimensions of competitive advantage (see Figure 5) and the most successful companies focus on delivering superior value through one of these three strategies while meeting the industry standards in the other two (Treacy & Wiersema, 1995).

The Dimensions of Competitive Advantage

Product leadership, operational excellence and customer intimacy are value disciplines of successful companies.

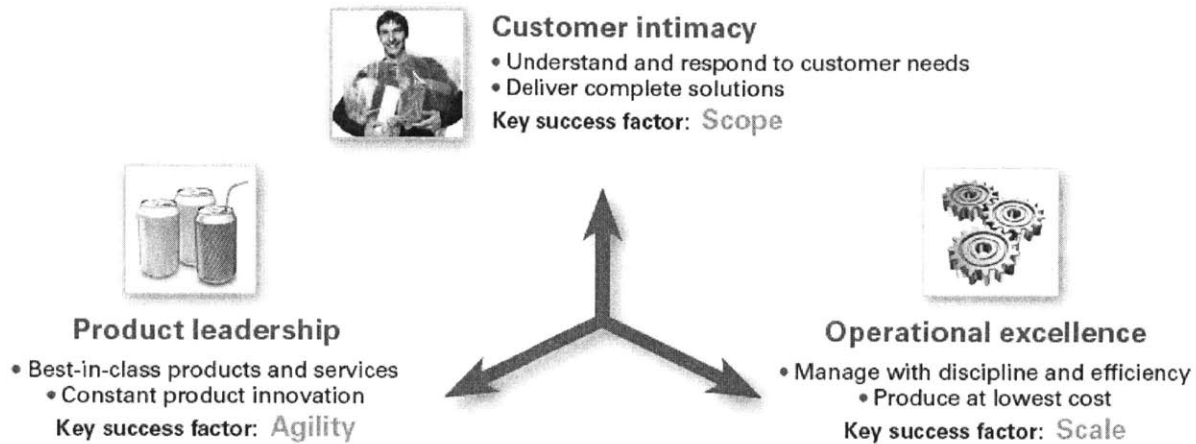


Figure 5 Dimensions of Competitive Advantage

Source: The Discipline of Market Leaders (Treacy & Wiersema, 1995)

In implementing these generic strategies, IT plays an important role. The below section provides overview of each of these three strategies along with the corresponding IT strategies.

Cost Leadership Strategy

In this strategy, the firm banks on its cost advantage to achieve competitive position. The firm offers its product and services at a low price in the industry which enables it to gather large market share. The main emphasis is on finding and exploiting all sources of cost advantage so that company can offer product services at a lower price. This strategy is usually associated with large-scale businesses offering standard or no-frills products with relatively little differentiation that are perfectly acceptable to the majority of customers. This strategy produces significant barrier to entry for new entrants in the industry since it is hard for new entrant to offer products

at such low cost. If a firm can achieve and sustain overall cost leadership, then it will be the above average performer in its industry.

IT Strategy for Low Cost

Companies that harness cost leadership strategy use IT solutions to reduce their costs through increased productivity and reduced need for employee overhead. Using IT for strategic initiatives can remove redundant tasks, reduce complexity and automate some organizational process. This leads to reduction in cost which enables organizations to offer its product and services at lower price and reap benefits of economies of scale. Some of the IT based strategic initiatives can be effective use of online communication channels and outsourcing of activities which can provide some cost benefits etc. Generally organizations outsource secondary activities or activities in which they lack core competencies, most of those organizations do get cost benefits through labor arbitrage (Farrell, 2003). In case of companies which are producing standardized products at a large scale, effective use of IT to automate activities in different business process like production, distribution, logistic etc. can substantially reduce cost and can help those companies to get long term market advantage. Sometimes companies use IT strategies for better capacity utilization and to improve its efficiency of business activities through speed and responsiveness which eventually results in cost reduction. An example is the use of IT to store and retrieve information/data such as medical records. Contrary to this line of thinking of reducing complexity with effective use of IT, some research also suggests that IT can also increase transaction cost when substantial efforts are needed to adjust the complex requirements (Cordella, 2006). Considering these IT initiatives provide competitive advantage, it is difficult to comprehend the sustainability of this competitive advantage since competitors can adopt similar strategies to lower cost through IT.

Differentiation Strategy:

Contradictory to low cost strategy, this strategy allows firm to charge premium price for its products. This premium price is associated with the innovation, higher production cost and perceived extra value-added features offered to the customers. A company differentiates itself from its competitors by providing these extra-value added features in its products. This differentiation allows a company to uniquely position itself in the industry, and aside from charging premium prices, hopefully increase product sales and build brand loyalty. Brand loyalty, rather than low cost, helps in building barriers to entry in the industry. Differentiation strategy creates values for customers for which the customers are willing to pay.

IT Strategy for Differentiation

Companies generally build innovative products, and better services through effective implementation different new IT technologies (hardware, software, IT systems). This innovation creates differentiation, which in turn leads to SCA. These strategies allow companies to get premium price for their innovative products, thus increasing profitability. Often, IT also enables companies to gather customer information, such as demand, more quickly so that companies can offer more appropriate and innovative products and services to the market as compared to their competitors. IT also helps in faster building and delivery of these products. IT based differentiation strategies makes it possible for the companies to innovate faster which makes them early adopters in the market and provides first movers advantage. Even if competitors commoditize and imitate the product or services, the companies will always have an advantage of being the first mover in this space. This sort of IT is considered to be strategic IT investments and allows companies to gain competitive advantage and increase market share via sales growth (Weill & Aral, 2004). Even though these IT initiatives are considered valuable for competitive

advantage, their effect for SCA is not confirmed. Since, considering the attractiveness of the industry, competitor is incentivized to innovate and develop similar innovative products/services which erode away the competitive advantage. So, companies that have competitive advantage need to continuously come up with innovative quality products.

Customer Intimacy

Customer Intimacy is a strategy in which companies segment the market and align development/delivery of its products/services around the current and future needs of that customer segment (Treacy & Wiersema, 1993). Companies that excel in this strategy need to have detailed knowledge about customer choices, behavior, and past purchases. They also need to be good at responding to the changing patterns and demands of their customer segments i.e. they need to act effectively on the customer insight. The faster and customized deliveries of products result in satisfied customer base which help in building customer loyalty. This strategy can generate benefits like better business returns, efficient customer acquisition, increase customer loyalty, and recurring revenue opportunities. In this strategy there is greater importance to the customer's lifetime value to the company than the value of any single transaction. This strategy is often considered as an indicator that shows relationship closeness between the vendor and the customer. It forms engaged customer base and this can lead to competitive advantage.

IT Strategy for Customer Intimacy

IT plays critical role in enabling companies to implement customer intimacy strategy. IT is used to not only effectively gather knowledge of customer's purchases, buying patterns and preferences but also is essential to mine and analyze this data to help higher management in making informed decisions about new product launches, discounts etc. Customer insights are captured and processed effectively by leveraging advanced analytics software. This data is

presented in simple manner using IT tools like interactive dashboard, and reports to key decision makers. IT also play critical role in measuring the impact of initiatives that are taken based on this analyzed data. Customer Intimacy has two distinct dimensions: customer relations and marketing support (Kraemer, Gurbaxani, Dunkle, & Vitalari, 1996). Customer relations deals with value of IT in providing services to customers. While marketing support deals with use of IT like use of social media to effectively sell their products and services. So, this strategy provides effective information access and communications between organizations and its customers.

The main objectives of these three earlier strategies are to generate competitive advantage, increase the loyalty of customers and beat competitors. As explained earlier IT does play an important part in achieving those objectives.

Resources Based Framework

Contrary to the market based perspective the resource based view (RBV) argues that the basis for a competitive advantage of a firm lies primarily in the application of the bundle of valuable resources at the firm's disposal (Barney, Firm Resources and Sustained Competitive Advantage, 1991). Whether a resource is valuable is based on four main characteristics:

- **Valuable:** The resource should enable the firm to implement strategies that improve its efficiency or effectiveness.
- **Rare:** The resource should not be easily available. That means it is not equally distributed in competing firms.
- **Inimitable:** The resource should be hard to imitate.
- **Non-substitutable:** The resource should not be easily replaced by other substitutes.

RBV advocates that company's competitive position depends entirely on this bundle of resources rather than the industry in which it is competing and is based on two main assumptions:

(1) Resource Heterogeneity:

If the resources owned by any firm are also owned by competing companies then these resources cannot provide competitive advantage.

(2) Resource Immobility:

If the resources are hard to obtain and long lasting (immobile) then these resources create sustainable competitive advantage.

These two assumptions can be used to determine whether an organization is able to create a sustained competitive advantage. Resources include processes, assets, knowledge, attributes and capabilities. Resources like entrepreneurship and culture (Barney, Organizational Culture: Can it

Be a Source of Sustained Competitive Advantage, 1986) have also been examined through lens of RBV theory. The following figure (see Figure 6) depicts how the use of these resources can result in SCA over time.

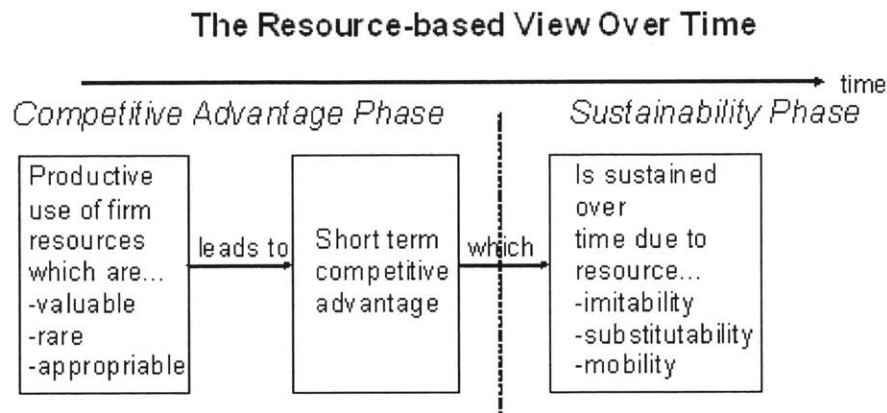


Figure 6 Resource Based View

Source IS-Theory⁴

The information systems literature identifies IT as an important resource in RBV and suggests that companies have different IT assets and develop different IT capabilities which lead to a differential competitive advantage. Therefore, RBV provides a robust framework to examine if and how IT assets and IT capabilities are related to SCA.

To understand the RBV for IT, we need to consider various aspects like IT investment, IT portfolio, and classification of IT resources and returns. As mentioned in chapter one, part of the literature is focused on whether IT investment creates value or not. For instance, Carr’s ‘IT Doesn’t Matter’ article (Carr, 2003) advocated that IT is ubiquitous, increasing inexpensive, and accessible to all firms. From an RBV point of view, the article says that IT is neither heterogeneous nor immobile, so IT cannot create a competitive advantage.

⁴ http://istheory.byu.edu/wiki/Resource-based_view_of_the_firm

If, however, we examine IT from an investment portfolio point of view, then different IT assets provide different returns. The IT portfolio literature also talks about returns on different IT assets and classifies those in four areas as transactional, informational, strategic and infrastructure (Weill & Aral, 2004). It says that the IT portfolio also needs to be balanced and aligned with long term and short term business strategy of company to maximize the benefits.

IT RBV literature examines a number of IT resources which may provide sustained competitive advantage. The different IT resources considered in the IT RBV literature are:

- (1) IT infrastructure
- (2) Technical IT skills
- (3) Managerial IT skills
- (4) Access to capital
- (5) Proprietary technology
- (6) Relationship infrastructure (Business unit and IT unit relationship)
- (7) Customer switching cost

IT resources can be defined in terms of *assets* (tangible or intangible) for e.g. information systems hardware, network infrastructure, access to capital and *capabilities*, which refer to skills for e.g. technical/managerial. For the SCA research, we have considered following IT resources and classified these IT resources into IT assets and IT capabilities as follows.

IT Assets:

- Access to capital
- IT infrastructure

IT Capabilities:

- Technical IT skills
- Managerial IT skills

Using the resource based view of the firm we explore this group of IT capabilities and IT assets through theoretical perspectives. The following model (Mata, Furest, & Barney, 1995) is used to evaluate if IT resources provide any SCA (see Figure 7).

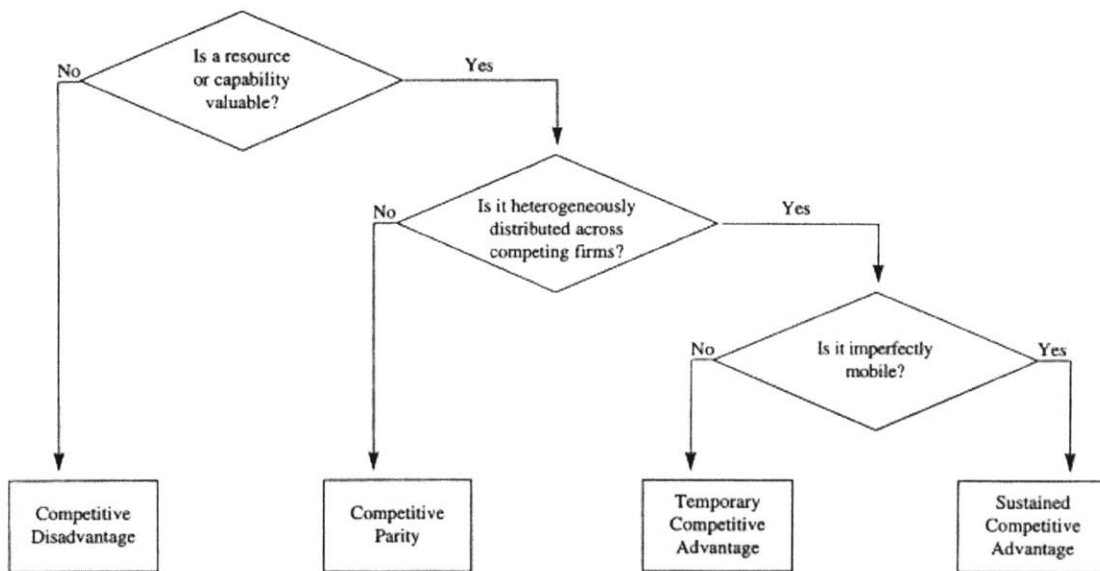


Figure 7 Model to Evaluate IT Resources

Source (Mata, Furest, & Barney, 1995)

IT Assets

The IT assets of a firm include software, hardware, IT infrastructure, and IT spending (access to capital), as well as things like the software environment. The two IT assets evaluated in our research are IT Infrastructure and IT Spending.

IT Infrastructure

IT infrastructure is a term that appears frequently in the information systems literature, but whose meaning is different from source to source. Generally, it refers to hardware, software, middleware, communications and IT networks etc. In the context of this study, IT infrastructure is defined as physical IT assets which consist of computers, communication technologies, the shareable technical platforms and databases (Ross, Beath, & Goodhue, 1996) (Weill, Broadbent, & Butler, 1996). IT infrastructure plays key part in faster delivery of operations and process, and is essential for building new capabilities. This should make IT infrastructure valuable and a source for attaining long-term competitive advantage (McKeen & Smith, 1996). Some research, however, suggests that IT Infrastructure is not source of SCA (Dehning & Stratopoulos, 2003). In the current industry landscape, though IT infrastructure assets are valuable, with proper planning, and access to capital it is possible to acquire this resource. So, from an RBV point of view, IT infrastructure is not heterogeneously distributed and hence does not provide any competitive advantage. This finding is consistent with previous research, based on RBV for IT (Mata, Furest, & Barney, 1995).

Access to Capital:

Access to capital refers to the capital that company invests in developing, deploying and maintaining IT. Many IT initiatives require large amount of investment for successful implementation, making this resource as valuable. Most of the time, these IT investments are

associated with risks such as technical uncertainties and market risks. These uncertainties make IT capital risky and cost of raising capital for such risky project increases substantially. Some companies have lot of cash at their disposal while others do not carry as much, making this IT resource as heterogeneously distributed across firm. Companies that have access to capital can make large strategic IT investments to help them to gain competitive advantage. But, since access to capital is heavily correlated with above mentioned uncertainties, slight changes in these uncertainties can make this resource mobile. This suggests that 'access to capital' is not imperfectly mobile. When we categorize this attribute according to the model above (see Figure 7) we see that 'access to capital' can give a temporary competitive advantage but is not a driver for SCA.

IT Capabilities:

Capabilities are considered as the company's ability to search, integrate and execute valuable resources. IT capabilities are considered strategically valuable for company's performance. IT capabilities indicate an organization's ability to integrate and deploy IT resources such as IT assets. IT capabilities may draw upon IT assets alone or combination of IT assets and other IT capabilities. Capabilities includes IT technical skills and IT managerial skills. It is possible that different IT capabilities carry different weights depending upon the organizational strategy and its ability to nurture them. The firms are heterogeneous in developing and nurturing IT capabilities; therefore they have different potential in leveraging information system (IS) for their competitiveness.

Technical IT Skills:

Companies need employees who are technically competent to innovate, develop and maintain IT. Technical IT skills are essential to build and use IS in the organization. It also increases organization's knowledge base. Hence, this capability is valuable. But, there is lot of dispute about mobility of IT technical talent. Some research suggests that this capability is immobile because it is hard to train new employees and sometimes existing IT technical talent is not replaceable. If a firm has pre-existing IT skilled resources it will be easier for them to adopt and make maximum utilization of firm's IT. On the other hand, IT based RBV suggests that this capability is mobile and it is easier to obtain technical IT skills in the labour market (Mata, Furest, & Barney, 1995). Empirical studies have demonstrated that IT technical skills are not source of SCA (Dehning & Stratopoulos, 2003). We acknowledge that these skills are valuable but with proper planning, access to capital and sound execution, a company can train its existing employees or hire new competent employees. That makes this IT capability as valuable but not a source of SCA since it is not heterogeneously distributed.

Managerial IT Skills

Similar to technical talent, companies need employees who have an ability to develop and exploit IT applications to support and enhance other business functions. Managerial IT talent's main task is to combine technical resources and skills to carry out various business activities. They also need to understand the business functions to come up with innovative and/or optimized solutions using IT i.e. it is essential skill required to architect or support IT strategic initiative. Their other main functions are to understand the business needs of other functional managers, suppliers and customers. This capability is often linked with reduction in cost and lead time while developing IT (Bharadwaj, 2000). Since this capability needs through understanding

of firm specific business processes and IT used in those business processes, it requires long period of time to develop and nurture. This explains why this IT capability is heterogeneously distributed among firms. Since managerial IT skills capability is valuable, highly immobile and heterogeneously distributed among firms, it is considered as one of the source of SCA (Dehning & Stratopoulos, 2003) (Mata, Furest, & Barney, 1995).

Following table summarizes above discussion about IT resources and their role is creating SCA. This table is compiled through literature review as mentioned earlier (even though there is some discrepancy over technical IT skills and IT infrastructure as a source of SCA).

Resources	Valuable	Heterogeneously Distributed	Imperfectly Mobile
IT Infrastructure	Yes	-	-
Technical IT Skills	Yes	-	-
Managerial IT Skills	Yes	Yes	Yes
Access to Capital	Yes	-	-

Table 1 IT Resource and its valuation

Composite Model

With both market and resource based view, a composite model (Spanos & Lioukas, 2001) was proposed by Spanos Y.E. and Lioukas S. This model takes into account the commonality and differences between market based view model and resource based view model.

The integrated model tries to identify the relative impact of industry and firm specific factors on firm performance (Spanos & Lioukas, 2001). The following diagram shows the integrated model and describes the relationship between firm assets, industry forces, strategy and firm performance (market performance and profitability).

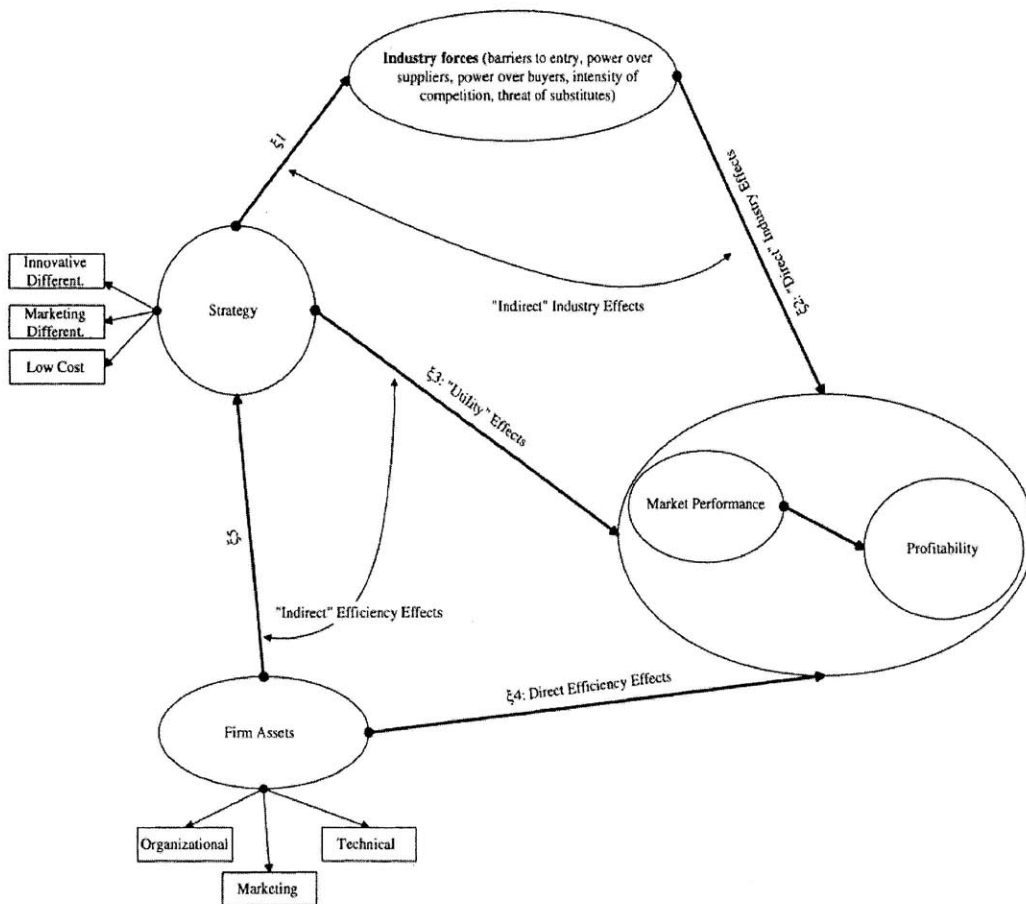


Figure 8 Spanos, Lioukas Composite Model

Source (Spanos & Lioukas, 2001)

The composite model describes three main relationships to firm performance. They are a strategy effect, a firm asset effect and an industry forces effect; these three serves different purpose altogether. The strategy effect relates to necessary condition to provide above average performance and firm effect provides sustained performance over a longer time horizon. The strategy effect relationship is covered in both competitive forces and resource based view models. The industry effects are covered in competitive forces model while the firm asset effects are covered in resource based view model.

Rivard, Raymond and Verreault (Rivard, Raymond, & Verreault, 2004) applied the composite model proposed by Sponas and Liokas from IT strategies point of view and proposed following research model.

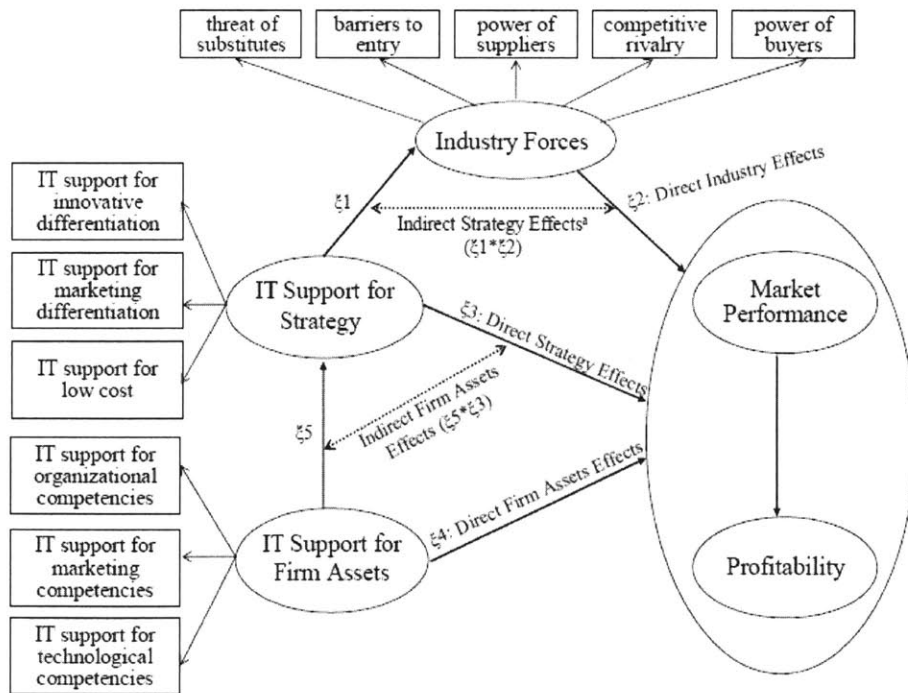


Figure 9 IT Composite Model Framework

Source (Rivard, Raymond, & Verreault, 2004)

This model captures effects of both IT support for business strategy and IT support for firm assets on firm performance. Similar to the composite model, the IT composite model has three types of effects. Those are industry effects, IT support to strategy effects and IT support for firm assets effects.

IT support for strategy describes how IT can be used to support for both cost leadership and differentiation strategies. The IT support for strategy has both direct as well as indirect effect on the firm performance and profitability. The indirect effect is through its relationship with industry forces. The IT support for firm assets relates to impacts of support provided by IT to the firm's resources. The firm assets have direct effect on performance and profitability and indirect effect on performance and profitability through its relationship with IT support for strategies.

As mentioned earlier, IT composite models build on the studies examining the combined effect of a market based view and a resource based view to firm profitability and performance.

Chapter 3: Conceptual Framework and Hypotheses

Chapter 2 provided an overview of Information Technology (IT) strategic frameworks. This is helpful in understanding the impact of different IT constructs on sustained competitive advantage (SCA). I propose a more holistic and an integrated research model for understating this impact of IT on SCA. The research model considers the similarities, and differences between different perspectives in the context of SCA. This section defines the research model and hypotheses. The model and hypotheses development is based on the literature which was discussed in the earlier chapter.

Sustained Competitive Advantage Research Model

The following figure shows a high level snapshot of the proposed integrated research model.

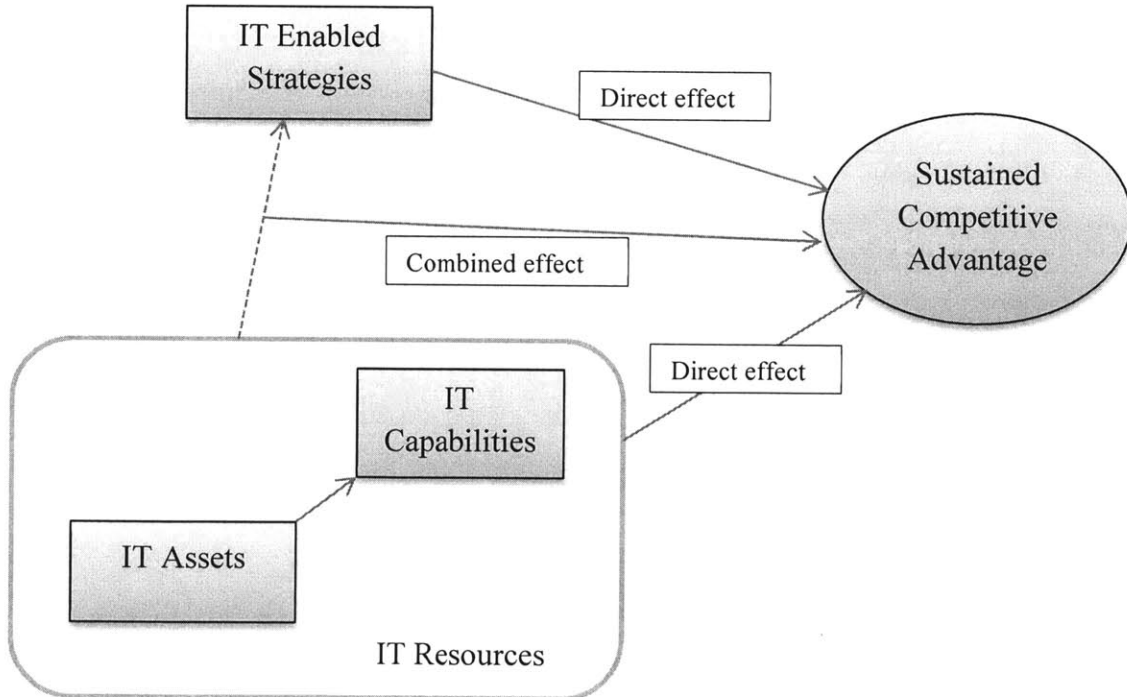


Figure 10 SCA Research Model

The literature review posits that an organization can achieve SCA by proper utilization and effective deployment of IT. This research model explains the individual as well as the combined effect of IT enabled strategies, and IT resources on achieving the SCA. The proposed SCA research model has four main components:

- Sustained Competitive Advantage
- IT Strategies
- IT Assets
- IT Capabilities

Sustained Competitive advantage

SCA is defined as a company having competitive advantage for duration of time. Companies with SCA enjoy above average profitability in that industry. These companies should have IT strategies, assets and capabilities which are difficult for competitors to acquire or imitate. As shown in following figure (See Figure 11) the research model considers duration, profitability and year on growth as constituent for SCA

IT Enabled Strategies

IT enabled strategies are positioning strategies based on competitive forces within the industry context. These strategies, namely IT strategies for low-cost, IT strategies for differentiation and IT strategy for customer intimacy are the strategies considered in the proposed research model.

IT Assets

IT infrastructure and access to capital are considered as part of IT asset block.

IT Capabilities

Managerial IT skills and technical IT skills are condensed as main capabilities in this model.

The following diagram shows a detailed view of components used in the research model. It also lays out hypotheses H1, H2 and H3, discussed in next section.

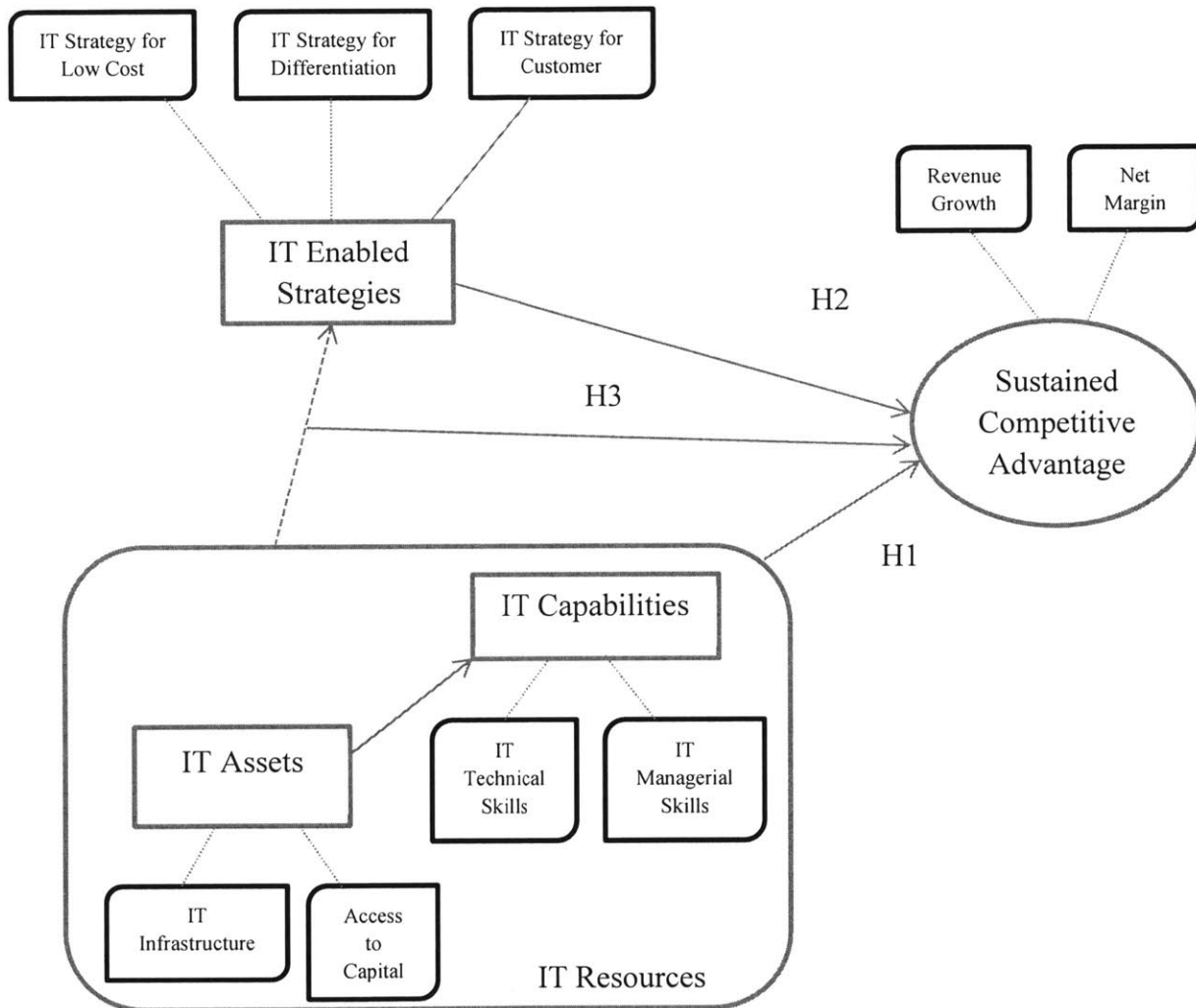


Figure 11 SCA Research Model Detailed View

The theoretical discussion about the effect of IT on sustained competitive advantage from Chapter 2 underlies the hypotheses in the next section.

Hypotheses

The SCA research model indicates there is direct and combined effect of these various IT strategies, capabilities and assets on SCA. The direct effect is defined when any IT strategies, IT capabilities and IT assets alone or combination of them within their corresponding groups are affecting the SCA. While the indirect effect refers to combine result of different IT strategies and IT resources.

Direct Effect

Hypothesis H1: No IT resource except IT Managerial Skills provides SCA

As discussed in Chapter 2, IT resources are categorised as IT assets and IT capabilities. This categorization leads to following sub hypotheses.

H1a: No IT asset provides SCA

From an IT RBV point of view, IT assets such as IT infrastructure and access to capital are considered valuable but their heterogeneity and immobility is yet to be verified (Mata, Furest, & Barney, 1995) (Dehning & Stratopoulos, 2003). As show in Table 1, I expect that these two IT assets are not significant source of SCA.

H1b: No IT Capabilities except IT Managerial Skills are source of SCA.

Companies nurture IT Capabilities to gain SCA which makes IT capabilities valuable.

Companies use assets to build strong capabilities. As pointed out earlier, easy availability of technical skilled resources in labour market makes IT technical skills capability mobile hence IT

technical skills should not be source of SCA (Dehning & Stratopoulos, 2003) (Mata, Furest, & Barney, 1995). Because an IT Managerial Skills capability is hard to acquire or build and it is considered as source of SCA (Mata, Furest, & Barney, 1995) (Dehning & Stratopoulos, 2003).

Hypothesis H2: A single IT Enabled Strategy has more impact on SCA compared to a combination of IT Enabled Strategies.

IT enabled positional strategies such as IT strategy for cost leadership and IT strategy for differentiation are fundamentally different and require different skills and vision to implement. This assumption is based on similar views about general positional strategies from literature (Porter M. , 1998), which advocates that there is underlying tension between these two strategies and implementing any one strategy can adversely affect the other one. As mentioned earlier, a differentiation strategy goes after premium pricing for product, which if true, jeopardizes a company's cost leadership strategy. Firms combining these two strategies are stuck in middle (Porter M. , 1998). A customer intimacy strategy also requires a significant amount of investment, which makes this strategy incompatible with a cost leadership strategy. A contrary view is that companies need to pursue both low cost leadership and differentiation strategies together to get SCA particularly in industries where there is no unique low cost position (Hill, 1988). This notion may be valid for mature industries where many companies have the same minimum cost structure and thus differentiation can form basis of competitive advantage. This consideration may not be valid for every industry, so I hypothesize that having single IT Strategy can be better recipe for SCA rather than combining different IT strategies. Similar to generic positioning strategies I do not expect that each IT enabled strategy alone can lead to SCA (Porter

M. , 1998) because the effect of these IT strategies depend a lot on how competitors move and this effect is susceptible to erosion by competitor moves.

Indirect effect

Hypothesis H3: A combination of IT enabled Strategies, and IT Resources provides SCA

A company uses IT assets to nurture its IT capabilities. Different IT resources are used by companies to support implementing various strategies like cost leadership, differentiation, customer intimacy and diversification. (Barney, Gaining and Sustaining Competitive Advantage, 1996). IT enabled strategies alone should not act as source of SCA but when these IT enabled strategies are combined with IT resources—even though specific IT resource does not provide SCA—the combined effect can led to SCA.

Chapter 4. Testing the Sustained Competitive Advantage Model

The last chapter lays out a research model for evaluating effect of Information Technology (IT) on sustained competitive advantage (SCA). I used data from several IT surveys to test the hypotheses. Massachusetts Institute of Technology's (MIT) Center for Information Systems Research (CISR) conducted two matched surveys in 2007. One survey, covering IT investments, went to IT finance personnel in a company and the other survey, asking about IT practices, was answered by the company CIO. The testing of SCA model is done on the data set gathered through these surveys. This chapter focus on the approach of model testing, variable calculation and mapping in the context of SCA model and documenting the results.

Data and metrics

Two surveys were administered by MIT Sloan's CISR (CIO and Financial Surveys, 2007; see appendix I and II for relevant survey questions). The surveys have questions related to overall IT spending by companies, percentages spent on various IT resources, digitization, IT governance and IT capabilities, among other things. Responses from these two surveys were used to prepare the dataset to evaluate the research model. The combined dataset has 1510 responses representing stakeholders of various companies. Two executives, the CIO and an IT finance personnel of various companies representing around 22 distinct types of industries, answered these surveys.

For this thesis, the responses of executives belonging to publicly listed companies across the world (with the majority of these from the USA) with financial data available from year 2006 to year 2010 are used. Since SCA advantage is over a period of years, I used forward looking

financial performance measures. The surveys were completed in early 2007 (questions covered the 2006 fiscal year), and financial performance measure data from year 2006 to year 2010 was collected. The company financial information was gathered from Compustat and the employee size of company, used as a control variable, is from FY 2007. This filtering process of only considering companies with financial performance data available from year 2006 to year 2010 timeframe reduced the dataset sample size to 265. After removing outliers⁵ from this size, the number reduced to 209. These 209 responses represent 186 unique companies from 22 industries. The 22 industries were consolidated into 9 groups for the model verification purpose. Industry similarities are considered for this consolidation work. The following table provides information about the industry distribution.

⁵ Used SPSS Scatterplot to remove outliers

Consolidated Industry	Percentage of Companies ⁶
Manufacturing	31
Financial Services / Insurance / Banking	22
Information Technology Services / Software Services / Information Technology/ Media / Professional Services	17
Pharmaceuticals / Biotech	6
Automobile / Transportation / Distribution / Retail	10
Telecommunications	5
Energy and Mining / Oil and gas / Metals	4
Utilities	5

Table 2 Survey response industry distribution

In addition, several measures of firm's financial performance were compiled to use for SCA. To incorporate both growth and profitability into a measure, I created a market basket measure using net margin percentage and year on year revenue growth for the SCA variable calculation. The following formulas were used to calculate net margin and revenue growth.

Financial Performance Ratios	Formula Used
Net Margin	$(\text{Net Income} / \text{Rev}) * 100$
Revenue Growth	$[(\text{Rev Year 1} - \text{Rev Year 0}) / \text{Rev Year 0}] * 100$

Table 3 Financial Performance Ratios Table

⁶ Rounded to nearest decimal number

Industry differences in company performance are controlled by creating industry adjusted measures for revenue growth and net margin percentage. First I calculated sample means for revenue growth and net margin percentage for each large industry category. Industry adjusted revenue growth and net margin percentage for each company is calculated by subtracting that company specific industry's sample mean revenue growth and net margin percentage from corresponding revenue growth and net margin percentage of the company. After this, the average over four years was calculated for each revenue growth and net margin percentage. The SCA is calculated by combining and calculating the mean of the average revenue growth and net margin percentages.

Control variable

I controlled for firm size by taking the logarithm of the number of employees. This employee size refers to the number of employees in that organization in year 2007.

Calculated Variables

There are four parts of SCA model.

1. The SCA variable is calculated using net margin percentage and year on year revenue growth.
2. The effect of three IT strategies on SCA is considered. For IT enabled strategies for low cost survey responses use question E-1 from MIT CISR Financial Person Survey (see appendix II for question). Similarly, for IT enabled strategies for customer intimacy survey responses for question E-3 is used (see appendix II for question). To calculate IT enabled strategy for differentiation the company's spending on innovation and new product development are combined. New product development and innovation are required for differentiation strategy as mentioned earlier in chapter 2. The responses for

question C from CISR's CIO Survey (see appendix I for question) is used for calculating percentage spend on innovation and question C-2 from IT financial survey (see appendix II for question) responses is used to calculate spending on new product development. The mean of these two variables responses are used to calculate a variable representing IT enabled strategy for differentiation.

3. Two types of IT assets are considered in testing our SCA model, IT infrastructure and IT access to capital. For calculating IT infrastructure variable, responses to question D from IT financial survey (see appendix II for question) are used. I define access to capital as the amount of money spent by the company for all its IT related activities including building and maintaining new IT systems, and strategic investments for IT. It is calculated as percentage of revenue. The responses to question A-2 (see appendix II for question) are used to calculate IT spending.
4. Technical IT skills and managerial IT skills are the IT capabilities I measured in the SCA model. For technical IT skills, responses for F-1 question (see appendix II for question) are used to calculate the variable. Similarly, for managerial IT skills responses for F-2 question (see appendix II for question) are used to calculate the variable.

The interaction variables are created by normalizing each independent variable by calculating its z-score, and then taking the product of those two variables (Cohen, 2003). For example, to calculate combined effect of IT capabilities, I first took z-score of technical IT skills and managerial IT skills variable. I then took the cross product of these two z-scores. I considered the effect of IT technical skills, IT managerial skills and the calculated cross product of these two to

assess the combined effect of IT capability. Similarly, to calculate combined effect of IT assets, I first took z-score of IT infrastructure and IT spending and then calculated the cross product.

Sometimes questions from the surveys asked for responses for two years. In those cases, I used the mean to calculate the variable. For example, in case of IT infrastructure the question asked for companywide IT expenditure on activities which can be classified as IT infrastructure for year 2006 (actual) and year 2007 (budget). So, the variable for IT infrastructure represents mean of actual and budget expenditure for IT infrastructure.

The following table (see Table 4) shows the descriptive statistics of the variables from the model.

The descriptive statistics table does not contain z-scores of any variable.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Technical IT skills	209	4	5	4.55	.499
Managerial IT skills	209	4	5	4.51	.501
IT Access to Capital	134	.001	.625	.054	.090
IT Infrastructure	193	.32	.95	.573	.139
IT Strategy- Low Cost	193	.03	.36	.211	.073
IT Strategy-Customer Intimacy	193	.01	.24	.110	.046
IT Strategy - Differentiation	209	.07	.43	.127	.062
Sustained Competitive Advantage	206	-100.32	50.00	-.433	18.919

Table 4 Descriptive Statistics of Model Variables

Model Specifications

I tested the SCA model in three stages. Each stage corresponds to one hypothesis. For example, for hypothesis H1a, I tested the SCA model using linear regression with just the control variables. In the second step, the model was tested using linear regression with individual IT assets. In the last step I tested the model using linear regression with a combination of IT assets. The independent variables used in the regression model are different for each hypothesis/stages. The different combinations for each stage are as follows.

Stage One: Hypothesis H1: No IT resource except IT Managerial Skills provides SCA

Hypothesis: H1a	No IT asset provides SCA
Dependent Variable	Sustained competitive advantage
Independent Variable	<p>Model One - Log of number of employees (control variable)</p> <p>Model Two⁷</p> <ul style="list-style-type: none"> a. IT access to capital b. IT infrastructure <p>Model Three⁸</p> <ul style="list-style-type: none"> a. IT access to capital b. IT infrastructure, c. Cross product of IT access to capital and IT infrastructure

Table 5 Model Details for Hypothesis H1a

⁷ I tested each variable individually

⁸ Combination of these independent variables are tested in one pass

Hypothesis: H1b	No IT capabilities except managerial IT skills are source of SCA.
Dependent Variable	Sustained competitive advantage
Independent Variable	<p>Model One - Log of number of employees (control variable)</p> <p>Model Two⁹</p> <ul style="list-style-type: none"> a. Technical IT skills b. Managerial IT skills <p>Model Three¹⁰</p> <ul style="list-style-type: none"> a. Technical IT skills b. Managerial IT skills c. Cross product of managerial IT skills and technical IT skills

Table 6 Model Details for Hypothesis H1b

⁹ I tested each variable individually

¹⁰ Combination of these independent variables are tested in one pass

Stage Two: Hypothesis H2

Hypothesis: H2	Single IT enabled strategy has more impact on SCA as compared to combination of IT enabled strategies.
Dependent Variable	Sustained competitive advantage
Independent Variable	<p>Model One - Log of number of employees (control variable)</p> <p>Model Two¹¹</p> <ul style="list-style-type: none"> a. IT strategy for low cost b. IT strategy for differentiation c. IT strategy for customer intimacy <p>Model Three¹²</p> <ul style="list-style-type: none"> a. IT strategy for low cost IT strategy for differentiation Cross product of above two IT enabled strategies OR b. IT strategy for low cost IT strategy for customer intimacy Cross product of above two IT enabled strategies OR c. IT strategy for customer intimacy IT strategy for differentiation Cross product of above two IT enabled strategies OR d. IT strategy for customer intimacy IT strategy for differentiation IT strategy for low cost Cross product of above three strategies

Table 7 Model Details for Hypothesis H2

¹¹ I tested each variable individually

¹² Combination of these independent variables are tested in one pass

Stage Three: Hypothesis H3

Hypothesis: H3	Combination of IT enabled strategies, and IT resources provides SCA
Dependent Variable	Sustained competitive advantage
Independent Variable	<p>Model One - Log of number of employees (control variable)</p> <p>Model Two¹³</p> <ul style="list-style-type: none"> a. IT strategy for differentiation, IT assets combined, IT capabilities combined OR b. IT strategy for low cost, IT assets combined, IT capabilities combined OR c. IT strategy for customer intimacy, IT assets combined, IT capabilities combined OR d. IT strategy for customer intimacy, IT strategy for differentiation, IT strategy for low cost, Cross product of above three strategies with IT assets combined and IT capabilities combined

Table 8 Model Details for Hypothesis H3

¹³ Combination of these independent variables are tested in one pass

An inter-correlation table of key model constructs is as follows (see Table 9).

Correlations¹⁴

	Sustained Competitive Advantage	Technical IT skills	Managerial IT skills	IT Access to Capital	IT Infrastructure	IT Strategy-Low Cost	IT Strategy-Customer Intimacy	IT Strategy - Differentiation
Sustained Competitive Advantage	1							
Technical IT skills	0.017	1						
Managerial IT skills	-0.04	0.002	1					
IT Access to Capital	-0.014	0.043	0.117	1				
IT Infrastructure	-0.015	-0.051	-0.055	-0.019	1			
IT Strategy-Low Cost	0.008	0.039	0.085	0.032	-0.933**	1		
IT Strategy-Customer Intimacy	0.025	0.064	0.008	0.015	-0.767**	0.510**	1	
IT Strategy - Differentiation	0.04	0.037	-0.073	0.058	0.018	-0.017	0.003	1

** . Correlation is significant at the 0.01 level (2-tailed).

Table 9 Correlation table

As seen in above table no key model constructs are correlated (positively or negatively) with SCA.

¹⁴ Pearson Correlation is reported

Results

I tested SCA model in three stages (one stage for each hypothesis). The following tables show the results of the regressions and depending on the significance of result we document result for each stage.

Stage One: Hypothesis H1a and H1b

Hypothesis H1a: No IT asset provides SCA

Variable	Model 1 (Controls)	Model 2.a (H1a)	Model 2.b (H1a)	Model 3 (H1a)
Organization Size (log10 of Emp)	-0.094	-0.096	-0.049	-0.04
IT Infrastructure		-0.023		-0.025
IT Access to Capital			-0.007	0.008
Cross product of above two				0.065
N	193	179	122	111
Adjusted-R2	0.004	-0.002	-0.014	-0.031
Standardized coefficients are reported +=p<.1, *p<.05, **p<.01, ***p<.001				

Table 10 H1a Hypothesis Result

Conclusion: Since Adjusted R2 value is not significant, no IT asset alone or combination of these two IT acts as a source of SCA. **Hence H1a hypothesis is supported.**

Hypothesis H1b: No IT Capabilities except IT Managerial Skills are source of SCA.

Variable	Model 1 (Controls)	Model 2.a (H1b)	Model 2.b (H1b)	Model 3 (H1b)
Organization Size (log10 of Emp)	-0.094	-0.095	-0.092	-0.095
Technical IT skills		0.028		0.03
Managerial IT skills			-0.045	-0.042
Cross product of above two				-0.062
N	193	193	193	193
Adjusted-R2	0.004	-0.001	0	-0.005
Standardized coefficients are reported +=p<.1, *p<.05, **<.01, ***p<.001				

Table 11 H1b Hypothesis Result

Conclusion: These regressions are not statistically significant, so neither technical IT skills nor managerial IT skills capabilities are a source of SCA. The results related to technical IT skills capability is in line with the hypothesis but contrary to the hypothesis, managerial IT skills do not provide SCA. **Hence H1b is partially supported.**

Hypothesis H2: Single IT Enabled Strategy has more impact on SCA as compared to Combination of IT Enabled Strategies.

First Table shows individual effect of strategies while next table shows combined effect on SCA.

Variable	Model 1 (Controls)	Model 2.a	Model 2.b	Model 2.c
Organization Size (log10 of Emp)	-0.094	-0.095	-0.095	-0.097
IT Strategy for Low Cost		0.016		
IT Strategy for Differentiation			0.042	
IT Strategy for Customer Intimacy				0.03
N	193	179	193	179
Adjusted-R2	0.004	-0.002	0	-0.002
Standardized coefficients are reported +=p<.1, *p<.05, **<.01, ***p<.001				

Table 12 H2 Model 1 and Model 2 Results

Variable	Model 1 (Controls)	Model 3.a	Model 3.b	Model 3.c	Model 3.d
Organization Size (log10 of Emp)	-0.094	-0.099	-0.091	-0.09	-0.089
IT Strategy for Low Cost		0.03	0.051		-0.023
IT Strategy for Differentiation		-0.034		-0.025	-0.103
IT Strategy for Customer Intimacy			0.003	-0.024	0.063
Combination ¹⁵		0.032	0.117	-0.119	0.126
N	193	179	179	179	179
Adjusted-R2	0.004	-0.012	-0.001	0	-0.007
Standardized coefficients are reported +=p<.1, *p<.05, **<.01, ***p<.001					

Table 13 H2 Model 3 Results

Conclusion: There is no statistically significant result of individual strategies or combination of these strategies, making it hard to interpret whether any single IT Strategy has more impact on SCA than a combination of two or more IT enabled strategies. Thus **the H2 hypothesis findings remain inconclusive.**

¹⁵ Combination refers to combined effect of two/three strategies considered in that pass

Hypothesis H3: Combination of IT enabled Strategies, and IT Resources provides SCA

I have already documented the impact of individual IT resource and IT strategies. The following table shows the combined impact of each strategy and of IT Resources.

Variable	Model 1 (Controls)	Model 2.a	Model 2.b	Model 2.c	Model 2.d
Organization Size (log10 of Emp)	-0.094	-.042	-.045	-.039	-.027
Technical IT skills		.016	.013	.008	.009
Managerial IT skills		-.038	-.042	-.037	-.041
IT Access to capital		.017	.008	-.019	-.042
IT infrastructure		-.039	.028	-.032	.580
IT Strategy for low cost		-.002			.399
IT Strategy for differentiation				.018	-.012
IT Strategy for customer intimacy			.072		.294
Combination ¹⁶		.054	.030	-.072	-.138
N	193	111	111	111	111
Adjusted-R2	0.004	-0.061	-0.062	-0.052	-0.064
Standardized coefficients are reported +=p<.1, *p<.05, **<.01, ***p<.001					

Table 14 Hypothesis H3 result

Even when all three IT strategies are combined with IT resources there is a no statistically significant result, suggesting that a combination of IT enabled Strategies and IT resource does not provide SCA. **Hence hypothesis H3 is not supported by the data analysis.**

¹⁶ Combination refers to combined effect of all the variables involved in testing that mode.

The data analysis conveys that factors considered in SCA research model does not act as source of SCA. There are some reasons and limitations for this study which are discussed in the next chapter. Following table (see Table 15) summarizes the findings of this empirical analysis.

H1a: No IT assets provide SCA	Supported
H1b: No IT Capabilities except IT Managerial Skills are source of SCA.	Partially supported
H2. Single IT Enabled Strategy has more impact on SCA as compared to Combination of IT Enabled Strategies.	Inconclusive
H3: Combination of IT enabled Strategies, and IT Resources provides SCA	Not supported

Table 15 Results Summary

Chapter 5. Discussion, Limitations and Conclusions

Earlier chapters discussed a proposed sustained competitive advantage (SCA) research model. I tested this model using dataset gathered through surveys conducted by MIT CISR. This chapter discusses about the limitations, and the implications of this study.

Discussion

The SCA research model provides a holistic framework to analysis the effect of IT on SCA. Even though, the statistical analysis on dataset does not provide evidence of IT strategies and IT resources acting as significant source for SCA it may due to the various factors. These factors together may constitute for SCA. The effect of IT may be over shadowed by other factors since there are so many other different factors that could affect the financial performance of the firm. This may be one of the reasons that empirical analysis of this study does not show any result at a statistically significant level.

The SCA research model is based on IT constructs like IT strategies, IT capabilities and IT assets. This is comprehensive approach to evaluate the effect of IT on SCA but while considering the different IT assets and IT capabilities, some other parameters based on theoretical and empirical valuations need to be considered. The SCA research model considers IT access to capital and IT infrastructure as IT assets but the study should be expanded to include other IT assets like proprietary technology. The SCA research model considers technical IT skills and managerial IT skills as IT capabilities but the study should be expanded to include other IT capabilities related to IT-business relationship and training of IT resource.

I considered revenue growth and net margin to calculate SCA but other suitable measures may also be given weightage for conducting the analysis.

The effect of IT on SCA depends on how well the suitable measures used for evaluating performance, which IT strategies, assets and capabilities are used and how well companies understand, nurture and strategically use IT.

Limitations

This study has several limitations; some of those are inherent in survey based analysis and some are due to nature of SCA.

- Firstly, even though the dataset size of 1510 was adequate to conduct the analysis, applying various filters reduced the size to 209 responses.
- Since it is easier to obtain independent performance measures of publicly listed companies, I used data of those companies for analysis. Private companies' data also needs to be evaluated to understand the effect of IT on SCA.
- Most of the companies used in the data set are headquartered in the USA (almost 79%), which limits the global context of this study (see Appendix III for more information of distribution of company location in the dataset).
- I have considered financial and growth performance measure of companies for four year from year 2006 to year 2010. Some years in this period were associated with global slowdown. This can be one of the main reasons that revenue growth is negative for some companies from dataset. Also, there is no specific number of years associated with SCA; I considered four years for study. The number of years is dependent on industry as well as economic environment. Investigating effect of IT over longer financially stable horizon can provide more information.

- One final limitation is that the surveys I used to conduct this research were not specifically designed to test the market based perspective and a resource based view of IT and SCA explored in this study. A survey designed to test this model would include more relevant and varied constructs.

Conclusions

This study helps to explain the theoretical and empirical impact of IT on SCA. It provides an integrated model to analysis the effect of IT on SCA. This research model considers that both market based perspective and resource based view are essential for analysis of effect of IT on SCA. The SCA research model explores relationship between IT assets, IT capabilities and IT enabled strategies. It also lays down how these IT constructs affect SCA in both direct and indirect manner.

The empirical testing of this model validates some of the findings from IT – SCA literature. The results do not provide any evidence that can conclude any IT constructs alone or in combination as significant source of SCA but this may be due to a number of reasons (discussed in the Limitations section) as well as measurement error. I believe that there are various factors including IT which contributes to SCA and initiatives that consider these factors will provide SCA.

Appendix I: Survey Questions Used from MIT Sloan CISR CIO Survey

Question A:

What percentage of sales is accounted for by entirely new products or services introduced in the two years indicated to the right?

2006:
Expected 2007:

Question B:

What percentage of sales is accounted for by products modified or enhanced in the two years indicated to the right?

2006:
Expected 2007:

Question C:

Approximately what percentage of your company IT budgets (capital + operating expenses) targeted IT or business innovation objectives over the past three years?

Average 2004-'06: %

Appendix II: Survey Questions Used from MIT Sloan CISR Financial Person Survey

Question A:

- 1. What is your company's total IT expenditure (operations in millions of US\$)? Include hardware, software, outsourcing, contracting, communications, phone, depreciation, and people dedicated to providing IT services.

Actual 2006:
Budget 2007:

- 2. What percentage of the company's total annual revenues (including depreciation) is spent on IT? Include hardware, software, outsourcing, contracting, communications, phone, depreciation, and people dedicated to providing IT services.

Actual 2006: %
Budget 2007: %

Question B:

What is the total number of information systems employees in the entire company, including the central group? Please answer in numbers of people (or full-time equivalents).

Actual 2006:
Budget 2007:

Question C:

What percentage of your IT budget is allocated to running existing systems and to building new systems?

- 1. Running existing systems (including maintenance)

Actual 2006: %
Budget 2007: %

2. Building new systems

Actual 2006: %
Budget 2007: %

TOTAL: Actual 2006: 100%

Budget 2007: 100%

Question D:

Of the company-wide IT expenditure identified in Question A1, what percentage would you classify as IT infrastructure?

Actual 2006: %
Budget 2007: %

Question E:

Considering the management objective of the IT expenditure that is not infrastructure (i.e., applications), estimate the percentage that was to:

MANAGEMENT OBJECTIVES

1. Cut operating costs or process repetitive transactions (e.g., reduce costs of preparing and sending invoices or other transactions)
2. Increase or protect your sales or market share by providing improved customer service or products (e.g., online product customization)
3. Provide information of any type — including for management, reporting, sales analysis, control, communication, accounting, compliance, performance measurement, etc.

Actual 2006: %
Budget 2007: %

Actual 2006: %
Budget 2007: %

Actual 2006: %
Budget 2007: %

TOTAL: Actual 2006: 100%

Budget 2007: 100%

Question F:

HUMAN RESOURCES CAPABILITY: Please rate whether the following factors inhibit or facilitate effective IT use in your company.

HUMAN RESOURCES CAPABILITY	<i>SIGNIFICANTLY INHIBITS</i>	<i>NO EFFECT</i>	<i>SIGNIFICANTLY FACILITATES</i>		
1. Technical skills of IT people	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
2. Business skills of IT people	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
3. Ability to hire competent IT staff	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
4. IT Skills of business people	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

Appendix III: Dataset additional information

Table showing representation of companies in the dataset on the basis headquarters location.

Country	Representation %
United States	78.8
United Kingdom	2.9
France	2.4
Germany	1.9
Japan	1.9
Canada	1.4
Switzerland	1.4
Australia	1.0
Brazil	1.0
India	1.0
Netherlands	1.0
Sweden	1.0
Argentina	0.5
Bermuda	0.5
Czech Republic	0.5
Finland	0.5
Hungary	0.5
Italy	0.5
Korea	0.5
Mexico	0.5
Poland	0.5

Table 16 Representation of companies based on location

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