Maximizing Returns on Corporate Knowledge: Redefining Customer Support Policies

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Abstract

Manufacturers are faced with challenging decisions when fielding a customer support strategy capable of meeting the demands of the market while maintaining cost effectiveness. This research suggests strategies firms can employ to align the level of support with the product line marketed to consumers. Further, this research recommends opportunities to leverage the knowledge earned in new product development, manufacturing, and fielding of the initial product to realize profits and superior levels of customer support.

INTRODUCTION

Identifying methods to leverage knowledge held within a firm into competitive advantage is a central theme in the Knowledge-Based View of the Firm (Grant, 1996; Alavi, Kayworth, and Leidner, 2005). While this belief is becoming increasingly rooted in firms' business strategies, the underlying corporate culture can provide a significant obstacle to implementing and executing a knowledge-based strategy (Grayson and O'Dell, 1998, Janz and Prasarnphanich, 2003). Firms must not only acknowledge the significance of knowledge in their strategies, but must also foster a knowledge management culture to capitalize on the strengths inherent in a firm can uncover hidden profit sources. This research explores one of these potential profit sources: customer support.

New product development is spawning an increasing variety of products in the marketplace (Fisher et al., 1997). As these new products are developed, knowledge management systems are responsible for "the generation, representation, storage, transfer, transformation, application, embedding, and protection of organizational knowledge," (Schultze and Leidner, 2002, p. 218). Therefore, the approach firms take toward capturing the knowledge created within a company during new product development, testing, manufacture, and distribution of a product can have a significant effect in the firm's customer support policies. Nearly all merchandise is accompanied by a customer support plan involving some level of manufacturer support for a specified time period (Daft, 2006). Given the significant investment a firm makes in product development and knowledge capture, this firm is in a unique position to capitalize on product support profit streams.

The purpose of this study is to produce guidelines for original manufacturers to follow when making support decisions for their products based on a knowledge management perspective. This set of considerations will balance an understanding of customers' range of desires from lowest cost products through all-encompassing system solutions with the manufacturers' financial, personnel, and time constraints. The development of guidelines begins with a review of current literature and a brief discussion of change theory, strategic competitive theory, and types of change as they apply to this situation.

LITERATURE REVIEW

This review of current literature in business, marketing, manufacturing, and organizational behavior fields captures current research pertaining to customer support practices and implementation of knowledge management systems. The first portion of the review discusses the concepts of customer support and explains the difference between discontinuing support of a product and exceeding the useful life of a product. The second section explores the theory behind organizational change and incorporates Porter's organizational strategy work and technology change theory into understanding the options available to a manufacturer. Finally, this literature is synthesized with Mathur's support strategy research into a new framework to evaluate customer support policies under varying product life cycle conditions and customer expectations.

Customer Support

For every product, some measure of support is required by the customer. This support takes on many different forms and includes several different areas. The overarching purpose of each of these areas is to meet the customer's expected purpose over the life span of the product (Loomba, 1998). Clark (1988) found the most important factor to customer satisfaction was the product's in-service rate, or "customer up-time." Further, numerous researchers have linked positive customer satisfaction with customer retention (Armistead and Clark, 1992; Teresko, 1994, Christopher et al, 1991) and have identified customer satisfaction as a key competitive advantage (Goffin, 1998; Hull and Cox, 1994). Therefore, manufacturers will strive to meet the customer's expectations by providing a level of service required to increase up-time, promote satisfaction, raise retention, and encourage propagation of their customer base (Fornell, 1992; Lambert, 1999).

A review of relevant literature proposes various elements of customer support appropriate to unique contexts. For the purposes of this research, focus will be on the following five elements: installation, user training, documentation, communication centers, and manufacturer product support (Goffin, 1999; Goffin and New, 2001; Armistead and Clark, 1990; Mathieu, 2001). Every product will incorporate a unique combination of these areas to provide the "right amount" of support to the customer at the "right value" to the manufacturer (Fornell, 1992). Specific definitions of these areas immediately follow while more general recommendations for different product types will be explored later in this paper.

Installation is often the first opportunity to provide after-sales customer support. Numerous factors can affect the decision about who is responsible for readying the product for

operation and may be decided by either the manufacturer or the customer. In general, the more complex a system, the more likely the manufacturer will provide installation services, either directly or through a third party. Typical installation support may include delivery to the operating location, unpacking, and placing the product into operational readiness (Goffin, 1999). For example, a customer purchasing a natural gas oven directly from a manufacturer is likely to expect the oven to be delivered to their home, placed into their kitchen, and connected to the gas source. In this case, the manufacturer's decision to support this service directly or through a third party may have profound impact on the customer's satisfaction. While numerous appliance service companies would be capable of performing installation, this customer contact may be the most significant impression the customer makes of the manufacturer's willingness to provide support and training and therefore have the largest impact on customer satisfaction with the purchase (Armistead and Clark, 1990).

User training frequently occurs in conjunction with installation for moderately complex products. This training is likely to include operation of the product, basic troubleshooting techniques in case of problems, and advisement of ways to request further service if needed (Athaide, Meyers, and Wilemon, 1996). However, training is not always limited to the operating location. In more complex products like computer networks or capital farm equipment, the manufacturer is likely to hold specialized training classes at a dedicated field training site to cover operation, maintenance, parts support, or various focused topics. The manufacturer would be training the user to become the system expert in daily operation and providing sources of support for more difficult maintenance or operational needs (Bauer et al., 1992). For the case of less complex systems such as a compact disk player, the training may take place in conjunction with the sale. This point of sale training may be supplemented through some form of

documentation in which the customer could assume responsibility for learning proper operation of the product.

As with the elements discussed before, the documentation can take on many forms. Any consumer product will include some documentation of warranty, basic operating instructions, and a source for further support if needed. More complex products are likely to include a troubleshooting guide to resolve user-level problems. Items such as vehicles, medical diagnostic equipment, or industrial machinery may have extremely specific operating guidelines as well as routine maintenance requirements and sources for spare parts and additional maintenance assistance (Goffin and Price, 1996). In the case of aircraft, there are several different documentation products focused on the operation (pilot or navigator), daily maintenance requirements (fuel, oxygen, inspection), minor maintenance requirements (100-hour checks), major maintenance requirements (overhaul), spare part specifications (FAA-approved part identification numbers), and entirely separate documents pertaining to the warranty and obligations of the manufacturer and user (contracts) (BAE Systems, 2006).

The fourth element linked with product support is a customer communication center. In modern products, this could take the form of online chat, electronic mail, and telephone call centers. The manufacturer's representatives may handle a single product line or numerous unrelated products. Additionally, the qualifications of the representatives may vary from basic comprehension of the language and ability to follow pre-scripted troubleshooting trees to highly-trained technicians with the ability to solve nearly all customer problems without leaving their desk (Gonzales et al., 1999). Customer communication centers have been shown to significantly reduce warranty costs by providing a first line of troubleshooting without sending a costly

technician to the operating location. An additional benefit is the opportunity to gain additional profit by charging for the customer support beyond the warranty period (Grant and Schlesinger, 1995).

The final element of customer support presented in this research is the concept of manufacturer product support. This broad area includes methods in which the manufacturer provides direct service to the product including warranty claims, product upgrades, spare part provisioning, unscheduled repairs, and preventive maintenance. Warranties provide customers with financial protection against unexpected major repairs and obsolescence for a fixed period of time (Loomba, 1996). With many manufacturing companies forecasting more than 50 percent of the total life cycle cost of a product occurs after it is operational (Jackson and Ostrom, 1980), warranty service can be an order winner for manufacturers as well as a potential source of additional income through sale of extended warranties (Loomba, 1996; Eveld, 2005). Product upgrades follow in similar patterns as warranties. Free upgrades may be available for a fixed period beyond the initial purchase. Beyond this period, manufacturers may be willing to provide upgrades to keep the product on par with newer trends, but at an additional cost to the customer. Microsoft Corporation is an example of a company with a clearly delineated support process for free and fee-based upgrades to their operating systems (Microsoft Support Lifecycle, accessed 2006; Microsoft Windows Home, accessed 2006). Maintenance and repair service may be the simplest to measure and therefore the most commonly identified customer support element. Complementing Clark's (1988) findings that product in-service rate is the most important factor in customer satisfaction with a product; numerous studies have attempted to quantify the cost of downtime. One recent study involved 163 respondents from the manufacturing sector with diverse sampling of revenues ranging from under $10 million to over $5 billion. The researchers

revealed a downtime cost per hour of over $50,000 in 54% of the cases and over $500,000 per hour in 17% (Contingency Planning Research, 2001). Given this quantifiable value of maintenance and repair, it is not a surprise that this element is a large focus of manufacturers. In the US alone, there are over 800,000 jobs in the automotive service field (Bureau of Labor Statistics, 2006). As product lines evolve from complex systems to commodities, as in the case of personal computers, it becomes even more urgent for manufacturers to decrease logistics costs to maintain a beneficial repair-to-replacement cost ratio, which can be an effective competitive advantage (Hull and Cox, 1994, Lele and Karmarkar, 1983). Additionally, reduction of downtime, increased availability of spare parts, and improved efficiency of maintenance contribute to an increase in the switching costs for a customer. In other words, the customer is less likely to seek a replacement product from a competing manufacturer if their current product is readily repairable at a fraction of the replacement cost and the customer remains satisfied with the manufacturer of the original product (Cohen and Whang, 1997; Lambert, 1998).

Table 1. Elements of customer support and examples.

Customer Support Element	**Examples of Common Tasks**
Installation	Delivery, set-up, readiness for operation
User Training	On-site basic operation, point-of-sale training, intensive training at manufacturer's site
Documentation	User's manuals, warranty information, additional help contact information, detailed operational instructions, maintenance requirements, overhaul procedures, supply sourcing information
Communication Center	Respond to customer requests for information through the use of e-mail, instant messaging, telephones
Manufacturer Product Support	Warranty claims, product upgrades, preventive maintenance, repairs, spare part provisioning

Based upon these five elements, a general understanding of customer support and the requirements to achieve customer satisfaction is established. This research focuses on the opportunities a firm has to profit from customer support for specific product types based upon the knowledge inherent in the organization, the framework of industry clockspeed, and the product life cycle.

Product Life Cycle

The concept of a product's life cycle focuses on two specific characteristics. The first is the life cycle of the industry, which relates to Fine's (1998) concept of clockspeed. Fine and others have provided evidence of certain industries experiencing faster turnover, requiring new product introduction at a more rapid rate, and an increasing rate of obsolescence than others (Mendelson and Pillai, 1999; Klepper, 1996). The second characteristic of a product's life cycle includes the development, marketing, production, delivery, support, and ultimate disposal of an individual product (Mendelson and Pillai, 1999). A general understanding of these concepts becomes important to planning customer support policies and dealing with obsolescence.

Both manufacturers and customers must plan for obsolescence, though the term has very different meaning for each party. Most manufacturers generally identify the point in the product life cycle when production ceases as the transfer of the product line from "active" to "obsolete" (Mendelson and Pillai, 1999). Consumers generally have a more negative connotation of the term and envision immediate problems with repair service, parts support, and technical advice once a product is termed obsolete (Nelson, 1967). While each of these parties may not agree on

what the term means, they do agree that simply categorizing an item as obsolete does not immediately render it useless. In the automotive industry, each model year brings a certain degree of obsolescence to the previous model years. However, the car is no less useful to the owner than it was in the previous year. The industry does build upon customer's desires for new technical and styling changes so that the cumulative effects of a few minor changes over a few years encourage the customer to trade up for the latest model (Nelson, 1967). Similarly, consumers are not likely to replace heating or air conditioning units in their home with each incremental improvement in efficiency. Over time and as their current unit experiences higher failure rates, the customer is more likely to replace their obsolete equipment with an improved model. Even in product lines where the industry has experienced a revolution in technology such as the movement from records to cassette tapes to compact discs, the original technologies are not completely useless. However, an original equipment manufacture has little incentive to support a record player in the same manner as the newest compact disc player (Gersick, 1991; Cohen and Whang, 1997).

For the purposes of this study, obsolescence is the result of evolution of a product line due to improvements in performance, style, or capability. This categorization of a product as obsolete also generally indicates some degree of change in the support policy of the original manufacturer. The change may include such options as conversion from free technical support to a fee-based service, transfer of spare parts to a third party aftermarket supplier, hosting an internet-based user forum for members to access electronic support resources maintained by other members, complete termination of support, or numerous permutations between these. It is significant to note these definitions all pertain to the manufacturer's perspective of the product.

Nothing is specified about the continued usefulness or potential maintenance costs of the item to the owner (Daft, 2006; Lee, 2003; Sorensen and Stuart, 2000; Orlikowski and Hofman, 1997).

While the concept of customer support is clearly significant to manufacturers, the implementation of this support is complex. There is a point in time where companies producing the components evolve into new technologies and the product manufacturer is faced with a difficult decision. Do they continue to provide direct support to a loyal customer base or do they discontinue support for the older products and concentrate on supporting the myriad of new products being produced? The number of customers maintaining a specific older technology will continually decrease over time, which results in a lower demand for support at an escalating cost to both the manufacturer and the customer. Unfortunately, not all of these customers are willing to upgrade to the newest product line and could be swayed by competitors if left completely unsupported (Lee, 2003; Sorensen and Stuart, 2000). In addition to the potential loss of customers, Armistead and Clark (1990) demonstrate the significant cost of re-establishing the customer support competency after a failed outsourcing attempt in a white goods company.

Knowledge Management and Culture

As perplexing as customer support decisions are to firms, there are competitive advantages to investigating these challenges. The firm who invests time, effort, and capital into developing a product will be in the best position to provide support by maximizing the returns on knowledge management. Since the goal of a knowledge management system is to "shape itself so that it makes the most effective and efficient use of the knowledge it has" (Bennett and

Bennett, 2003), firms can leverage this knowledge to keep ahead of the competition. A firm practicing sound knowledge management techniques captures the intrinsic unique qualities of a product and positions themselves to provide repair guidance, spare part sourcing, documentation, or product support to their customers. The investment required to provide this support is minimal; the investment during product development, manufacturing, fielding, and warranty periods becomes sunk costs to developing a support strategy.

The prerequisite to leveraging knowledge to customer service is for firms to adopt the organizational values required to support the capture and sharing of knowledge (Davenport, DeLong, and Beers, 1998). In their 2003 work, Lee and Choi recognized that cultural factors, comprised in their research of collaboration, trust, and learning, are essential to effectively managing knowledge. In order for a firm to record the knowledge available during development, production, and fielding of a product, the organizational culture must be prepared.

THEORY AND PROPOSITIONS

Just as the mere definition of "obsolescence" changes with perspective, the underlying theories supporting customers and manufactures approach to obsolescent products differ. In 1964, Alexander understood the importance of perspective on the obsolescence decision. In writing about product elimination policies, he stated, "Exactly what these policies should be, what form these procedures should take…must vary with the structure and operating methods for the firm and with its position in the industry and the market" (Alexander, 1964, p. 7). This section will briefly explain the customer's supply continuity planning approach in order to

understand the more in depth explanation of the manufacturer's varied approaches which follows.

Supply Continuity Planning: The Customer's Approach

From a customer perspective, organizations should implement supply continuity planning during the acquisition process to ensure capital equipment performance. Supply continuity planning is a subset of business continuity planning involving identification of potential problems early in the life cycle of a product to ensure an organization is able to maintain a competitive advantage from unforeseen events (Zsidisin, Ragatz and Melnyk, 2005; Elliott, Swartz, and Herbane, 1999). An example of this would be a customer purchasing an aircraft hydraulic servicing cart unique to a new generation Boeing 787 aircraft. By applying sound supply continuity planning, the customer would research previous generations of Boeing aircraft and determine the expected life cycle of the aircraft. Contracts would be made with the manufacturer of the servicing cart to provide spare parts and technical support for the expected life cycle of the cart. By working closely with the manufacturer, the customer has decreased the likelihood of owning an expensive piece of equipment that cannot be repaired.

During the negotiation process with equipment suppliers, purchasing organizations should take the product, process, supply chain structure and design issues into consideration at the same time. This approach, also known as 3-dimensional concurrent engineering (Fine, 2000), should include the evaluation of suppliers at multiple supply chain tiers, such as those firms that manufacture key repair part items for their viability during, and even after, the expected life of the equipment. Contingencies such as inserting contractual clauses that allows the purchasing

organization to acquire critical parts tooling and having suppliers willing and available to manufacture those parts can result in improved performance and cost if a decision is made to extend the life of the equipment.

Technology Change Theory and Strategic Planning: A Manufacturer's Approach:

Traditional organizational change theory examines the dynamic forces involved in migrating from a certain practice or method to another. Kurt Lewin discussed the concept of "unfreezing, change, refreezing" in terms of manufacturers desiring to maintain a steady state interrupted by short periods of predicted change. These periods of change would be well-advertised in advance, minimal in duration, and significant to the company (Lewin, 1948a; Lewin 1948b). However, in the modern competitive markets, companies who fail to change risk becoming obsolete in their fields (Brown and Eisenhardt, 1997). Companies no longer have the opportunity to provide employees with long periods of steady state without change. This belief led to an important advance in traditional change theory termed technology change theory (Orlikowski and Hofman, 1997).

The technology change theory model is based on two assumptions setting it apart from traditional change theory. The first is that change is constant. Manufacturers in many fields no longer seek a steady state, efficiency-minded approach to their products. Rather, these firms opt for the flexibility and capability of quickly reacting to changing markets made possible only through constant readiness for change. The second assumption is that not all of this change is predictable (Orlikowski and Hofman, 1997; Mintzberg, 1987). Some industries, such as airlines

and electronics, are constantly initiating change to keep up with market pressures (Miller and Chen, 1994; D'Aveni, 1994). Others continually promote new products and retire previous product lines in order to remain competitive in new markets or compete across numerous industries (Burgelman, 1991; Chakravarthy, 1997; Souza et al., 2004).

While the previous works have focused on the organizational change, this research focuses on specific product lines involved within a change. As companies introduce streams of new products to remain competitive, existing products are constantly being updated, phased out of production, and gradually made more obsolete with each new generation. This evolution provides a challenge to the manufacturer in terms of balancing profitability with product support. This study extends technology change theory an additional step by incorporating Porter's competitive theories on strategy and Nelson's theory of opportunities for change into the framework.

Porter introduced three generic organizational strategies in his research published in the early 1980s. These strategies include cost leadership, differentiation, and focus strategies. The cost leadership strategy involves production of a standard product as efficiently as possible. The goal is to provide a price-discriminating consumer with a stable product at the lowest market value. Differentiation strategy is more appropriate for firms producing a unique product in their field and competing for market share based upon product features. This product is marketed to the price-insensitive consumer who desires flexibility in the product and greater degrees of specialization. The third strategy, focus strategy, addresses smaller niche customers (Porter, 1980; Porter, 1985). While the first two strategies will generally be embraced by a firm as a whole, the focus strategy is most often implemented for certain product lines or production

facilities (Wright, 1987). The focus strategy is intended to meet the needs of a few specific customers who vary from the average shopper either by seeking extremely cost-effective solutions with no features or by seeking extremely differentiated products offering the highest levels of clockspeeds.

It is proposed that a cost leadership strategy would be appropriate for products with extremely short life cycles and in which the manufacturer deems a low level of support is required. An example would be an inexpensive digital music player. For a product existing in a high clockspeed market with low cost to produce and high repair costs, the manufacturer is more likely to replace a defective product than service it. Therefore, the manufacturer is likely to provide limited documentation, point-of-sale training through a third party retailer, and a communication center to provide warranty claim processing or minimal technical assistance.

> P1: Commodity merchandise historically associated with a cost leadership strategy has the highest levels of customer satisfaction per unit cost with an undifferentiated customer support policy.

For products providing a comprehensive solution including a product and intensive customer support, a differentiated strategy to customer service is projected to be most appropriate. These products would be deemed worth providing a high level of customer support by the manufacturer and would have slower clockspeeds than the digital music player example. A more likely product in this area would be an encompassing inventory control computer system for a small business. The manufacturer would understand the complexity of the system and the substantial investment the customer is making. The support would require installation of the

system, detailed and extensive training of the users, specific documentation for daily operation and maintenance of the system, a 24-hour communication center with technically-savvy representatives able to assist with system maintenance, and available technicians and spare parts for unexpected repairs.

> P2: System merchandise historically associated with a differentiation production strategy has the highest levels of customer satisfaction per unit cost with a differentiated customer support strategy.

Porter's focus strategy is believed to apply to the outliers of these two groups. These specialized customers and products would differ from the norm and lie outside the diagonal. If a Ford F-150 truck would be positioned between the groups as a product requiring routine levels of support and having an average life cycle, a $250,000 Bentley Arnage caters to a focused group of individuals who demand the highest levels of customer support. On the other side of the focus group, certain customers will be seeking a version of a centrally-located product with the most basic features and minimal support at a bargain price. In either case, these customers fall into niches where specialized manufacturers can cater to the customer support demands. In general, it is important to recognize these customers, but they will not fall cleanly into an overall typology.

Considered together, implementing Porter's approach to product support strategy leads to the following two propositions:

P3: Service merchandise historically associated with focus strategies has the highest levels of customer satisfaction per unit cost with a differentiated customer support strategy.

P4: Product merchandise historically associated with focus production strategies has the highest levels of customer satisfaction per unit cost with an undifferentiated customer support strategy.

In his 1967 work on obsolescence, Nelson evaluated a previous survey on organizational change. He discovered an important rule of thumb that still holds today. He identified "the rate of change in any area of activity is directly proportional to the number of possibilities" (Nelson, 1967, p. 175). While this may seem intuitive, it is an important cornerstone never explicitly stated in future organizational change research, but is the foundation of Fine's (1998) clockspeed theory. While industries such as computer manufacturing are at the forefront of constant change in products and features, one of the reasons is the opportunity for improvement in this market and the resulting higher clockspeed. In their research, Brown and Eisenhardt noted, "The high-velocity computer industry…is an attractive one for this study because of its extraordinary rate of change. During the 1993 – 1995 period of this study, there was an growing convergence with telecommunications and consumer electronics, a rise in multimedia applications, assaults on the standards, and the emergence of the Internet" (Brown and Eisenhardt, 1997, p. 2). Clearly the opportunities for improvement facilitated growth in the market and increased the rate of obsolescence in previous product lines. Similarly, Figure 1 illustrates the research Mendelson and Pillai (1999) conducted clearly demonstrating the decreasing product life cycle, or increasing clockspeed, of a diverse range of industries.

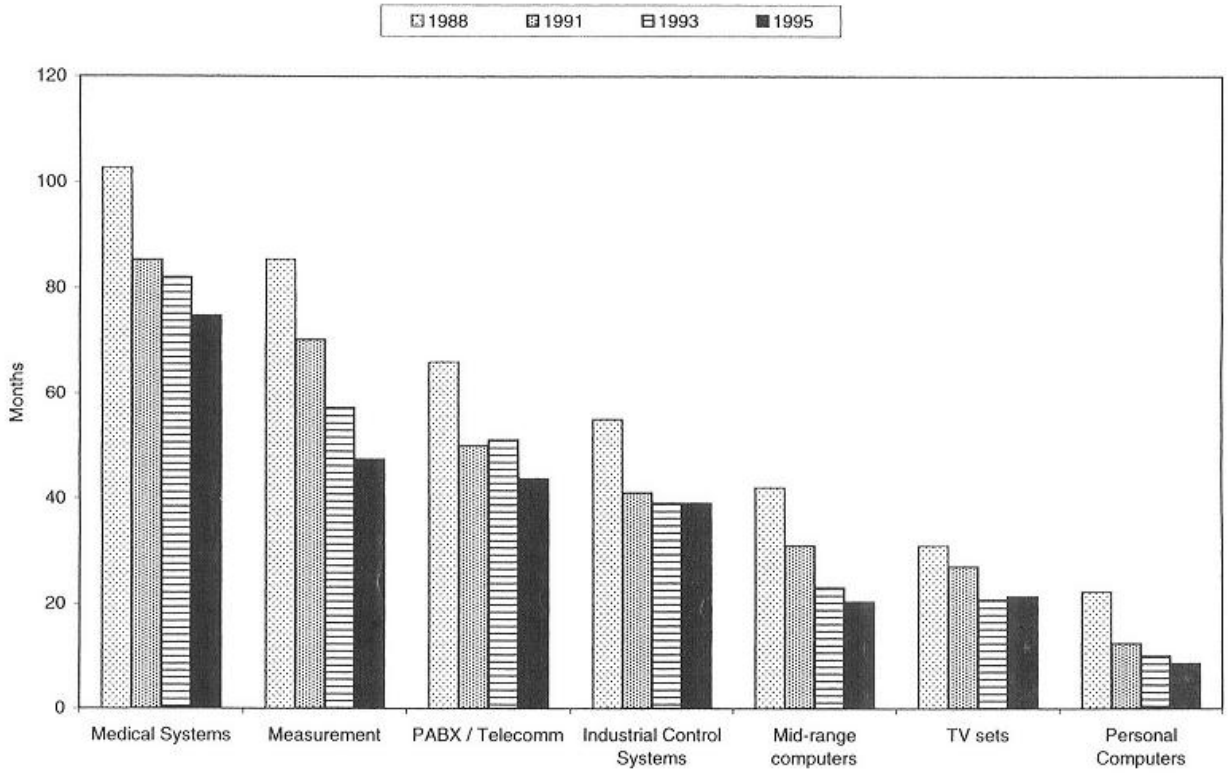

Figure 1. Decreasing life cycle as demonstrated by market life of various products as measured between 1988 and 1995. The bars reflect the span from first production item shipped to the marketplace until the last item was produced (Mendelson and Pillai, 1999).

In his 1988 work, Mathur incorporated Porter's views on strategy into a 4-square reflecting the inclusion of degrees of specialization on each axis. On the vertical axis, the degree to which the merchandise being sold is differentiated is recorded. On the horizontal axis, the degree to which the service supporting the merchandise is differentiated is recorded. The resultant 4-square provides a great deal of insight into the categorization of a customer's acquisition. Analyzing the 4-square through computer systems illustrates the point. In the top left corner, where both axes are highly differentiated, the customer has purchased the entire system of hardware, software, and support. Moving to the right, certain brands try to distinguish themselves while providing minimally-acceptable levels of support. In the bottom left corner,

other companies will sell generic hardware with phenomenal support structures for any customer problems. In the bottom right square, the "big box" retailers provide computers as commodities with extremely little support included (Mathur, 1988; Mainelli, 2006; Armistead and Clark, 1990).

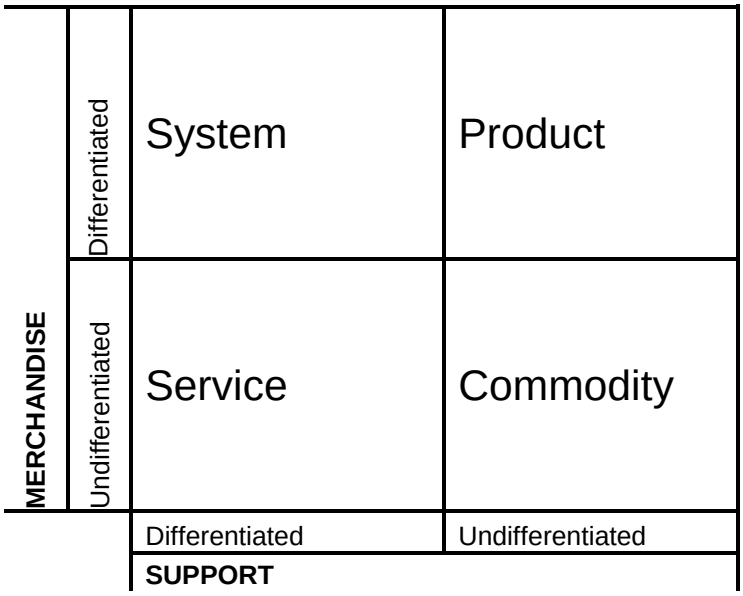

Figure 2. Competitive strategies viewed through merchandise and support perspectives. Mathur, 1988, p. 34.

Putting all of the previous theoretical discussions together, Figure 3 summarizes the remaining propositions of this work. By combining Mathur's 4-square with Porter's views of strategy and Fine's theory of different clockspeeds, the resultant model suggests different patterns of customer support most likely to produce customer satisfaction and propositions 5 – 8 follow.

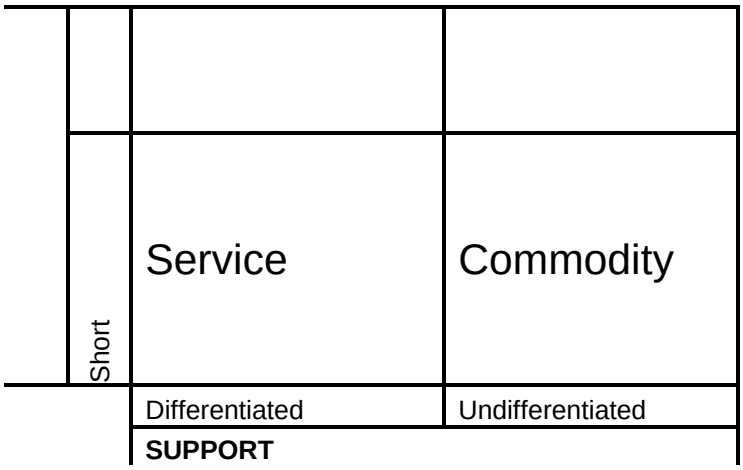

Figure 3. Mathur's (1988) competitive strategies viewed through product life cycle and support perspectives.

P5: For items with long life cycles and markets where the customer is seeking a system solution, a manufacturer providing high levels of support will produce higher levels of customer satisfaction per investment in support.

P6: For items with long life cycles and markets where the customer is seeking a stand-alone product, a manufacturer providing minimal levels of support will produce higher levels of customer satisfaction per investment in support.

P7: For items with short life cycles and markets where the customer is seeking a strong service support system, a manufacturer providing high levels of support will produce higher levels of customer satisfaction per investment in support.

P8: For items with short life cycles and markets where there are high levels of product substitutability, a manufacturer providing minimal levels of support will produce higher levels of customer satisfaction per investment in support.

The logic follows the computer example above, but suggests as new products are fielded, they are more likely to be in the upper left corner of the figure. As the product field approaches a commodity, the support structure should be adjusted to prevent "overservicing" of the customer at unnecessary expense. The lower right corner will have greater availability of product

substitution and the customer is less likely to remain loyal regardless of the level of customer support offered (Heskett, 1994; Klepper, 1996).

RESEARCH METHOD

The purpose of this study is to investigate the ability of firms to leverage knowledge gained in the development, production, and fielding of merchandise in customer support strategies appropriate for the targeted level of differentiation. To fulfill this goal, senior managers from four firms, each competing in one of the four corners of Figure 2, were interviewed. The interview protocol followed a semi-structured design with key informants. In designing the research, a qualitative approach was chosen because, as Yin (2003) argued, this type of approach is preferred when "how" or "why" questions are being asked and served as an information-gathering source for this exploratory study. The respondents were selected as key informants based upon their expertise with product development, information systems operating within the firm, and customer support practices. Two of the interviews were performed face-to-face while two were performed by telephone. The firms were specifically targeted according to their product-support design as presented in Figure 3 to ensure all four quadrants are evaluated as well as discovering differentiating aspects of the knowledge management and customer support practices. The semi-structured interview is included in the Appendix.

Firm A provides a system solution to its customers. This firm produces heavy machinery involved in a specialized process requiring extremely high in-service rates, immediate availability of spare parts, highly trained service technicians, and detailed operating instructions. The firm operates with a differentiated product and differentiated customer support strategy. The

product has a long life span and is likely to pass through several users before reaching obsolescence.

Firm B has a number of business units with outputs falling into all four of the quadrants in Figure 3. For the purposes of this study, the expert interviewed within Firm B is a manager within a business unit marketing a product. The product is expected to have life cycle approaching 20 years, but the initial support offered is undifferentiated from others competing in the industry.

Firm C provides a standardized product, but differentiates themselves from the competition through a specialized training and customer support program. Knowledge management systems have been integrated to better allow the network of service specialists to provide high levels of support to customers at a consistent level throughout the service area.

Firm D is similar to Firm B by having a number of business units falling within different quadrants of Figure 3. The interview focused on a line of commodity items available to consumers with undifferentiated support strategies.

DATA ANALYSIS

The responses to the semi-structured questionnaire are included in Table 1. While the sample size of one per quadrant precludes development of broad theory, study of the responses sheds insight into the development of theory and provides a solid base for future studies. Of immediate note, the two firms believed to be product-focused identified themselves as product differentiators. However, the two firms expected to be service differentiators position themselves as both product and service differentiators. As firms who manufacture the product which they provide service for, this finding should not be a surprise. While the firms have strong

reputations for the level of service provided, the service would be meaningless without a marketable product.

There are very few recurring themes among the firms. Each has a system to capture data ranging from engineering designs to service times. The common cultural trait involved shared values and a focused purpose within the organization. Each of the firms has a different focus on customer support and the potential of improving knowledge management practices.

Respondent A shared a number of data collection systems as the foundation of the knowledge management process at Firm A. However, she quickly noted the minimal use of this data in daily operations or strategic decision-making. The primary use of the data is to collect failure rates on parts to identify supplier reliability, stocking levels, and preventive maintenance schedules. The extensive customer support provided is a reflection of the complexity of the product as well as the criticality of keeping the product operating at peak performance for the operators. Respondent A saw very little benefit for fielding an improved knowledge management system. She based this assessment on the current high levels of customer satisfaction and respectable profit margins. She did acknowledge greater profits could likely return by better managing the information currently available to the managers, but believed it was unlikely any significant investment in technology or personnel to analyze the current data would occur in the near future.

Respondent B noted the enormous leap in knowledge capture that Firm B has taken in the past 5 years. He identified previous attempts to collect knowledge that resulted in large databases that few people in the organization could access or comprehend. The knowledge management program in place for the newest product securely manages different levels of information for different users and provides management with the ability to make informed

decisions about support, spare parts supplies, maintenance requirements, and future improvements as the products continue manufacture. The customer support consists of extensive installation, documentation, expert advice, and spares. With the expected lengthy life cycle of the product, Firm B hopes to capitalize on their expertise gained through development and manufacture of the product when future maintenance and spares contracts are let. Respondent B believed their extensive knowledge management system would be essential to renewing the current contract and keeping them ahead of the competition in their market.

Respondent C depicted the knowledge management system in Firm C as a tool for training, capturing individual site performance, and maintaining high levels of customer satisfaction. He noted the company had largely ignored metrics, documentation, or sharing information among sites for the past 15 years. Only when the company faced a sharp downturn in stock prices and market share did management institute a corporate information system. The turnaround has been significant both in market share and stock prices and is largely attributed to improved knowledge sharing and closer monitoring of the key metrics that the company was founded upon. In particular, simple, replicable processes are intended to bring high levels of customer satisfaction, minimal waste, and largest profits.

Firm D maintains numerous information and knowledge sharing systems. Respondent D noted information capture, security, and sharing as one of the strengths of the company. The

Firm	Interviewee Position	KM Program Description	Cultural Traits Conducive to KM	Customer Support Strategy	Product or Service Focus?	Potential Impact Of Improved KM
A	VP Purchasing	Capture and store data, do not use to make support decisions, helps with new product design and spare part inventory systems	Family business; efforts focused on retaining personnel, unique language, shared values	Set-up, documentation, warranty, 24-hour phone or e-mail, extensive spares inventory, training centers, maintenance teams	Both	Minimal; data is available, but no system is in place to make it useful, would not impact support system
B	VP Operations	Capture, store, apply, protect knowledge; key to competitive advantage	Shared values, rewards for cost avoidance, focus on building on good/bad from past to make new projects better	Installation, documentation, warranty, initial spares, maintenance teams available	Product	Vast opportunities; emerging electronic recording and transfer; security paramount; better support customer
C	Regional Director of Operations	Capture and evaluate information, disseminate information to front line, protect differentiating traits	Foundation of company; replicable, quality, shared values	Provide perfect customer interactions to earn repeat service opportunities	Both	Saw surge in stock performance after introduction; quality improved, could help with recurring training
D	VP Integrated SC	Capture data, transmit it across offices, analyze improvement areas, competitive difference	Security of knowledge is critical, build upon past performance with new product development	Documentation, warranty on par with competitors, replace rather than repair most defective items	Product	Spread best practices and lessons learned across company, integrate new suppliers quicker

Table 1. Summary of responses to semi-structured questionnaire from Appendix.

relatively short life cycle of the products dictates the engineering staff and manufacturing personnel learn from previous mistakes and best practices to quickly deliver a new product to the market. Firm D realized the danger of oversupporting its products and maintains a customer support strategy on par with the competition. There is documentation provided to the user and a relatively brief warranty period. Due to the commodity nature of the products, defective items are generally replaced rather than repaired during the warranty period. Respondent D noted improved efforts in the company to capitalize on the knowledge gained through manufacture in providing out-of-warranty service, but also identified third-party support as the primary after-warranty interface with the customer.

CONCLUSION

The propositions presented in this paper hold under review of four firms, each operating in different quadrants of Figure 3. As a theory-building study, this research offers a baseline for future research to explore the interaction of customer support, corporate culture, and knowledge management. As highlighted by the four firms, different strategies are appropriate for different product-support mixes and opportunities exist to leverage information currently captured within the firm to develop stronger customer support and higher profit levels. Further investigation is required to better understand this relationship and test the propositions set forth in this paper.

As discussed previously, the significant limitation of this study is the single firm per quadrant studied. Future studies should be two-phased. In the first phase, a broad survey of firms should expand upon the semi-structured interview to identify knowledge management

practices, cultural traits, and product or service differentiated strategies of firms in varied industries. This method ensures broad applicability of the propositions. The second phase of the study should focus on in-depth case studies with approximately ten firms per quadrant to gain a better understanding of the extent of knowledge management integration, the culture existing at different levels or sites within a firm, and the alignment of product/service differentiated strategies with the execution of these strategies.

Appendix. Semi-structured interview protocol.

Interview Protocol:

We greatly appreciate your time and support of this research project.

Name: _____

1) Please state your current and past positions in your firm and provide a brief description of your responsibilities in those capacities.

2) Knowledge management is the "generation, representation, storage, transfer, transformation, application, embedding, and protection of organizational knowledge" (Schultze and Leidner, 2002, p. 218). Does your firm have an active knowledge management practice? Please describe it.

3) Organizational culture has been described as essential to a firm's ability to manage knowledge effectively (Lee and Choi, 2003). Organizational culture can include practices of collaboration, trust, learning, ideologies, shared sets of core values, and language. Does your firm have an organizational culture supportive of knowledge management? Please describe some of the traits.

4) Customer support may include such areas as installation, user training, documentation, communication centers, and manufacturer product support. Does your firm provide customer support for your products? Could you select one product and describe its support strategy?

5) Do you differentiate your merchandise from the competition by product differentiation, service differentiation, or both?

6) If you were better able to capture, retrieve, and utilize the knowledge your firm gained through development, manufacturing, and fielding of your merchandise, would this affect the ideal product support strategy you would employ? How? Do you believe this strategy could make your firm more profitable?

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