Business Model Evolving:

Technology Strategy and New Value Capture Routines

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Abstract

When and how do business models evolve in a fast-changing environment? As a mediating link between technological innovation and firm performance, the business model is able to link two important dimensions of the firm: value creation and value capture. Yet, the construct suffers from fuzzy definitions, empirical silos, and a lack of theoretical development. Based on the existing literature, we build a value capture framework that is able to facilitate comparisons between a wide variety of business model types. Using a historical case study of two initiatives to extend a product-service business model at a technology product firm, the current paper explores when and how the business model as a system of organizational routines evolves as the firm's technology strategy continues to shift.

1   Introduction

When and how do business models evolve in a fast-changing environment? Schumpeterian innovation is often a time when new firms introduce new technologies as well as new business models to capture value from creative destruction (Schumpeter, 1942). The emergence of e-Business and web-enabled firms that accompanied the Internet in the mid-1990s has created a new context for old business models and in many cases spawned new business models (Amit and Zott, 2001, Baden-Fuller and Haefliger, 2013). Despite critiques of idiosyncratic definitions and empirical research proceeding in silos (Baden-Fuller and Morgan, 2010; Zott, Amit and Massa, 2011), a growing number of scholars agree that the business model is a key mechanism in how the firm creates and captures value (Chesbrough and Rosenbloom, 2002; Casadesus-Masanell and Ricart, 2010; Zott *et al.*, 2011). As a firm initiates or responds to technological change, in what ways might it alter its business model? While it is not surprising that entrepreneurial firms are likely to experiment with new business models (Zott and Amit, 2007, Doganova and Eyquem-Renault, 2009), the conditions under which established firms alter their business model is less clear. Despite the growing

interest among innovation and strategic management scholars, questions such as the ones addressed above are difficult to research because the business model construct "remains a theoretically underdeveloped (and sometimes overloaded) concept, which may raise doubts concerning its usefulness for empirical research and theory building" (Zott *et al.*, 2011 p. 1038).

The topics of technological innovation and business models are often conflated together. In some contexts, it is difficult to separate a firm's core innovation from its business model. However, recent work argues that the business model and technological innovation are two separate constructs (Baden-Fuller and Morgan, 2010). While a link between technological innovation and business models is understood to exist, exactly how business models change and evolve "in the wake of innovation" (Baden-Fuller and Haefliger, 2013 p. 420) remains a mystery. The factors that influence business model change within a dynamic, technology-intensive environment may provide deeper insights into ways that firms adapt besides simply developing new technological innovations. Polaroid developed a rich set of intellectual property in digital imaging, yet senior managers failed to question their choice in business model (Tripsas and Gavetti, 2000). Given the lack of theoretical development of the business model, we address this important gap with a longitudinal case study analysis to go inside the black box of business model change in a dynamic technology-intensive setting to understand *when* and *how* a business model evolves.

The current paper makes two primary contributions to the emerging business model literature. First, we develop a framework based on the extant literature to situate the value capture components of the business model that generate fees with those components that are offered to customers for free. The framework provides one way for researchers to understand the similarities and differences across various types of business models, and thereby suggests a path forward to connect prior work believed to be in fragmented silos.

Second, we specifically take a process research approach to understand how a business model within an established firm may change and evolve (Langley, 1999). The current study explores the addition and evolution of fee-based services to a product-service business model where the product transaction captures the fee and the service component is positioned as free. The current paper adopts the definition of the business model as a system of activities that enables value capture (Zott and Amit, 2010; Baden-Fuller and Haefliger, 2013). These activities are most likely to be interdependent and can be organized internally, externally, or in hybrid interfirm arrangements (Williamson, 1975). The current study suggests that an appropriate theoretical lens for the business model system of activities is that of the organizational routine from evolutionary theory (Nelson and Winter, 1982; Feldman and Pentland, 2003). Evolutionary scholars suggest that organizational routines are *predictable* patterns of behavior (Nelson and Winter, 1982), *recognizable* patterns of interdependent action (Feldman and Pentland, 2003), and *stable* (Parmigiani and Howard-Grenville, 2011). The addition and evolution of fee-based services is conceptualized as a set of new organizational routines to the existing business model system of routines. The debate among evolutionary researchers as to whether the routine is an agent of inertia and rigidity or a generative source for learning and change remains an open question. Nevertheless, the routine is viewed as a stable, recognizable, and repetitive pattern of organizational action that reaches to the individual level of analysis (Parmigiani and Howard-Grenville, 2011). The study of Polaroid indicates how persistent business models can be within established firms even while managers are cognizant of technological change (Tripsas and Gavetti, 2000). We uncover important boundary conditions under which changes in the firm's technology strategy influence changes in the business model. However, the link between technological innovation and the business model is not a co-evolutionary link and this suggests that managers cannot focus on one and neglect the other for survival (Tripsas and Gavetti, 2000). The business model context may also prove to be a rich setting in which to further

explore the challenge of aligning the ostensive and performative aspects of organizational routines in a dynamic environment (Feldman and Pentland, 2003).

2   Theoretical Background

Below we briefly examine the business model literature and connect it to the work on organizational routines.

2.1   Business Models as Routines

The topic of business models has been gaining in importance within the academic research community fundamentally because it represents the firm's mechanism for value creation and value capture. While many business models are enabled by technology, business models and technological innovation are believed to be two separate constructs (Baden-Fuller and Haefliger, 2013). The business model is suggested to be the mediating mechanism between the firm's strategy and its financial performance (Chesbrough and Rosenbloom, 2002; Zott and Amit, 2008; Baden-Fuller and Haefliger, 2013). Scholars in this domain suggest that the business model is currently an under-theorized construct that has been advancing but only within fragmented silos (Zott and Amit, 2008; Demil and Lecocq, 2010; Zott *et al.*, 2011).

Two primary gaps have hindered the development of a robust research agenda on business models. First, a diverse set of business model definitions exists and this has hindered progress (Zott *et al.*, 2011; Baden-Fuller and Haefliger, 2013). In the current paper, we adopt the definition of the business model as a system of activities that enable value capture (Zott and Amit, 2008; Baden-Fuller and Haefliger, 2013,). Second, the business model is an eclectic construct that touches multiple theoretical frameworks. As a mechanism that cuts across interfirm boundaries, transaction cost economics shapes decision-making (Williamson, 1975) as well as network theories (Zaheer, Gulati and Nohria, 2000). As a mechanism that requires resources, a resource-based view may shape how managers allocate resources to implement business models (Penrose, 1959; Barney, 1991;

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Demil and Lecocq, 2010). As an activity system, the value chain framework (Porter, 1985) is adequate for within-firm activities but is limited when considering hybrid boundary-spanning activity systems.

We address this gap by conceptualizing the business model as a value capture mechanism that is supported by a system of routines (Cohen *et al.*, 1996; Feldman and Pentland, 2003; Becker, 2004; Pentland, Hærem and Hillison, 2011). As a repeatable and predictable construct, the business model is sticky once a firm discovers success. Internal and external stakeholders often begin to closely associate the firm's offering with its business model. The business model may be a distinctive core competence for the firm, yet it may be an ordinary set of activities that is mimicked by all industry participants (Baden-Fuller and Haefliger, 2013). Organizational routines are stable, repeatable activities within the firm that also seldom change (Becker, 2004). Yet, the evolutionary economics literature does consider the conditions under which routines are adapted or inert.

In the current paper, our priors suggest that business models within a firm seldom change despite technological changes at the industry level and within the firm's strategy. We demonstrate how our conceptualization of the business model construct works with an exploratory historical case study that examines the when and how of two episodes where a technology product firm seeks to extend its business model. We specifically use a process study approach to understand the antecedents and to follow the process of adding and integrating new organizational routines. This process of routinization is suggestive of an evolutionary process of variation, selection, and retention that plays out over years where individual actors either self-select or are selected out of an aggressive, high technology culture. We examine the development of routines along three dimensions: stability of the underlying infrastructure, predictability (repetitiveness), and recognizability (awareness). Through this selection process, new business model options arise in ways that are perhaps not reflective of original ostensive plans (Feldman and Pentland, 2003).

2.2 Business Models and Value Capture

This area began to pick up during the Internet era that began in the mid-1990s (Amit and Zott, 2001). Much of the attention has been formally focused there. Examples include freemium (Baden-Fuller and Haefliger, 2013), cross-subsidized multi-sided markets (Eisenmann, Parker and Van Alstyne, 2006), pay-as-you-go (Desyllas and Sako, 2013), and software-as-a-service (Cusumano, 2008). Most of these business models involve a free or low cost of entry component. Nevertheless, research on the evolution of traditional business models has also been an emerging area of research. The razor-blade model popularized by Gillette in the early 20th century remains a common approach as seen by inkjet printer offerings. The idea of the razor-blade model is that most of the profits are made from the repeat purchase of supplies and consumables such as blades, paper, or ink cartridges rather than the main product – razor or inkjet printer. Xerox also relied on this type of business model for its copiers (Chesbrough and Rosenbloom, 2002).

An emerging community of scholars examines product-service business models and specifically how this approach is currently evolving at many technology product and manufacturing firms. The exemplar for an evolving product-service business model is IBM who today captures nearly 60% of annual revenues from its services business compared to 15% in the late 1980s. However, IBM is in some ways an outlier because they set an ambitious target to develop the largest services business in the IT industry (Gerstner, 2002). Other firms are contemplating this path but with a far less grandiose target (Suarez, Cusumano and Kahl, 2013; Cusumano, Kahl and Suarez, 2015).

Perhaps the most fascinating part of web-enabled business models is the significant free dimension and how this presents a major challenge for value capture and ultimately firm performance. The dot-com era was riddled with firms pursuing eyeballs before they designed a viable business model. Yet, the concept of *free* is not entirely foreign in traditional business models.

Within the razor-blade model, the "razor" can be a free or close-to-free item in an effort to quickly get consumers in the continuous cycle to purchase supplies and consumables. A classic product-service model is built on the policy of charging for the product and including the after-sales support and warranty as a perceived free item. The current study examines a case of this type of business model.

Innovative web-based models are usually about granting access or usage to a product or service whereas the traditional business is often focused on owning the product. In Figure 1, we plot examples of various business models side by side in a value capture framework. The horizontal axis reflects property rights extremes that show whether the customer will own the offering or merely use or access the offering following the culmination of a transaction. The vertical axis reflects which components of a business model generate fees and which components of the business model are free (real or perceived). Although the product-service business model is really a bundle, the service component has a stronger perception of free when compared with a two-product bundle. One product may be perceived with less value, but usually not as if it is free.

*** Insert Figure 1 about here

The examples of business models in Figure 1 are not intended to be comprehensive since new business models develop over time as new technologies and industries emerge. Yet, the framework is representative of many prominent approaches in traditional and web-enabled businesses. The framework is a useful starting point to explore when and how business models might change.

3   Methods and Data

3.1   Research Setting

To explore when and how business models evolve in the context of technological innovation, I sought to examine a rapidly changing environment characterized by intense

competition and technological change over a number of years (Teece, Pisano and Shuen, 1997). The research literature describes technology-intensive industries as high-velocity environments where industry structures are blurred and market players are constantly shifting (Eisenhardt and Martin, 2000). The EMC Corporation's professional services initiative between 1995-2010 is examined for two reasons. First, the enterprise data storage industry is closely linked to the computer industry and both have undergone rapid changes since the 1980s (Bresnahan and Greenstein, 1999). The enterprise information technology market shifted from a centralized, mainframe-oriented model to a distributed model with the rise of Unix workstations, Windows NT, and the Internet. A period of rapid growth and rapid decline occurred during the dot-com economic boom and bust.

Second, EMC was an independent product vendor that sold only hardware products for its first 15 years of existence. Hardware product sales were its primary mission and deliberate strategy. Until recently, service adaptation at IBM has been the isolated example of this emergent phenomenon considered within the strategic management literature (Davies, 2004; Harreld, O'Reilly and Tushman, 2007; Agarwal and Helfat, 2009). By comparison, Gerstner introduced IBM's Global Services division in 1995, but professional services at IBM were not a set of new business practices. Global Services was more of a consolidation of numerous approaches within the firm. The intent was to develop the largest IT services business in the world. For example, the firm developed prior experience through its wholly-owned subsidiary Integrated Systems Solutions Corporation (ISSC) that was launched in 1991 (Gerstner, 2002). ISSC enabled IBM to develop a strong foundation of organizational routines prior to the larger Global Services initiative. By contrast, EMC was starting from scratch. When EMC began its professional services initiative, it was a single-product firm with approximately 6,000 employees. IBM was a firm of over 200,000 employees and multiple product positions when Global Services began. Therefore, EMC's specialized technological beginnings, the availability of secondary data, and access to current and former employees made EMC an appealing

research setting to examine issues of business model evolution in the context of technological change.

3.2   Data Collection

For the analysis, a longitudinal case study design was adopted (Eisenhardt, 1989; Pettigrew, 1990). Given the nature of the question concerning how business models evolve, an inductive approach seemed most useful for theory building (Glaser and Strauss, 1967; Van de Ven, 1992, Miles and Huberman, 1994; Langley, 1999; Yin, 2009). The primary objective was to identify the organizational processes and forces that shaped the emergence and evolution of professional services at EMC. Data collection was an iterative process that spanned from late 2008 to early 2011 combining archival data with interview data. The longitudinal focus on EMC occurred within a larger project studying the emergence and evolution of new service initiatives among Information Technology hardware product firms from 1987-2008. The industry-level study began with preliminary open-ended interviews with individuals from HP, i365 (a Seagate company), IBM, Red Hat, and Unisys and analysts at the Technology Professional Services Association (TPSA) in order to understand the historical context and current perspectives of this phenomenon.

In order to grasp the historical context of EMC's technology and services activities, the following archival data were collected: (1) company 10-K and annual reports from 1987-2010, (2) news articles from the LexisNexis Academic database from 1982-2010, (3) over 2300 investment analyst reports of EMC from the Investext (ThomsonOne) database covering 1992-2010, and (4) transcribed oral history interviews from all three CEOs available from the Computer History Museum and the Computerworld Honors Program archives. The Investext data also included transcribed quarterly earnings conference calls starting from Q2 2002 and transcribed executive keynote speeches at analyst conference events. Archival data were complemented with semi-structured interviews with 14 current and former managers covering multiple time periods and

multiple perspectives related to professional services initiatives at EMC. The respondents represented a variety of prior experience from technology product firms to dedicated professional services firms. The semi-structured interviews incorporated questions about the respondents' career background and their perspectives on EMC service initiatives.

Interviews were conducted in two waves. The first wave occurred in May 2009 with two analysts, a director, and a senior vice president who shared the current status and challenges of professional services initiatives as well as their knowledge of historical developments. Their tenure at the firm was primarily after the dot-com economic downturn. The second wave occurred in 2010 after locating former managers who had specifically joined the company for the first professional services initiative. The second wave also included additional current managers in different parts of the Global Services organization. While two of the current managers had a brief tenure at EMC, they managed the EMC account relationship on behalf of their previous employers who were dedicated professional service firms. Their knowledge of EMC professional services initiatives was far greater than their tenure as EMC employees. The interviews were recorded and transcribed into 135 single-spaced pages (see Appendix Table 1 for more information about the informants).

As is common in qualitative research that involves interviews, informant bias is a concern. These concerns were mitigated in a number of ways. First, key evidence is triangulated between multiple informants and archival data from analyst reports and industry trade news. Second, information technology firms often have a high rate of employee mobility as individuals move between firms within the industry. A benefit of interviewing former and current managers is that converging information increases the accuracy and validity of the major constructs (Yin, 2009). Finally, informants were primarily middle managers who had to balance the vision of strategic initiatives with the resulting implementation. Several informants had experience in the corporate office and in the field with customers. Table 1 contains financial data from 1987-2010.

3.3   Data Analysis

The overall research process was highly iterative (Miles and Huberman, 1994). Drawing on data from these multiple sources, timelines of major corporate events and of major services events were created covering 1979-2010. The corporate events timeline included events such as acquisitions, product releases, industry-wide technology standards initiatives, and executive turnover. The corporate timeline provides a context for understanding technological change and the broader firm-level and industry-level context for professional services at EMC. The second timeline included major services events. Appendix Figure 2 provides a list of key search terms that was iteratively constructed and used to identify major services events within the investment analyst data, annual reports, Lexis Nexus news articles, and interview data. The initial objective was to understand the antecedents and evolution of the professional services initiative that began in 1997 as first identified from the 1997 10-K report. During the construction of the services timeline, I identified that the original professional services initiative was split into two initiatives in 2002: implementation services (the original professional services initiative) and a consulting services group. Given this discovery, the analysis proceeded with the knowledge of two change trigger events that provided temporal brackets: competitive shifts in 1995 and the dot-com economic downturn of 2001. The resulting service initiatives were established as EMC Professional Services in 1997 and Information Solutions Consulting (ISC) in 2002.

Across these two change events, the analysis began to identify the key themes expressed by the informants with respect to antecedents, mobilization of resources, development of organizational capabilities, and the managerial coordination effort required. As the analysis continued, 26 broad themes were identified from the interview data. Examples include "product

company identity," "complementary," "service differences," "resource allocation," "product and service differences," "professional services routines," "organizational fit and alignment," "prior experience," "credibility," and "resistance." For the two professional services initiatives, I wrote analytic memos to reflect on and synthesize different themes as they occurred in a chronological order. Supporting interview evidence and archival evidence were organized across major themes and placed in separate Excel spreadsheets. A descriptive narrative was written that worked to combine the chronological ordering of key themes in the context of larger corporate and industry-level events. The key themes were examined against the major concepts in the literature concerning the development of organizational routines (Nelson and Winter, 1982). The analysis continued with another reading of the interviews and examination of the timelines. The themes were further refined and consolidated.

Temporal bracketing focused the analysis on three time eras: the early founding and emergence of Symmetrix, the development of premium-priced Symmetrix solutions, and the post dot-com era. The link between technology strategy and the business model analysis is examined within each era to explore the question of when this link is activated. Once a business model change event is identified, we explore the process question of how does the business model evolve. The process specifically considers the forces that enable and disable the development of new organizational routines within the business model. A routine is established when stakeholders are aware of it (recognizability), trust its reliability and repetitiveness (predictability), and the routine is supported with an appropriate infrastructure that is generally available in the firm (stability). These processes are in place to support the development of a new extension to the value capture framework.

4   Findings

The findings section begins with a narrative that examines the mediating link of the business model between the firm's technology strategy and firm performance (Baden-Fuller and Haefliger, 2013). The narrative is bracketed into three temporal phases demarcated by two exogenous shocks. The first shock was the entry of IBM and Storage Technology Corporation into the disk array market in 1994. Trade journals indicated that other rivals were not far behind with their own disk array products. This series of events signaled the beginning of an anticipated commoditization threat and the erosion of Symmetrix's first mover advantage. We consider this a normal shock that high technology firms are accustomed to seeing. The second shock was a major jolt that caught the firm by surprise in 2001. The dot-com economic downturn combined with a superior disk array design from Hitachi Data Systems put the firm in crisis mode. Both of these events triggered processes that created an occasion for the business model to be altered.

4.1   Business model foundations (1979-1994)

The structure for this section is: EMC technology strategy, business model, and outcomes such as status of routines, firm performance, and temporal bracketing marker.

4.1.1 Technology strategy

Founded in 1979 by Richard Egan and Roger Marino as a manufacturers' representative business that sold DRAM and microprocessors for large tech firms such as Intel, the EMC Corporation launched its first plug-compatible memory product in 1981 to undercut the $36,000 per megabyte price of the proprietary Prime Computer memory product. The firm went public in 1986 and developed a solid reputation for the price/performance of its compatible memory product line. Additional memory products supported proprietary platforms from Digital Equipment Corporation (DEC), HP, IBM, and Wang.

EMC expanded its portfolio into external disk subsystem storage technologies in 1987 believing there to be considerable synergies between internal and external data storage. However, the firm experienced severe product quality issues in the field at customer sites. The firm repaired the defective products at no cost to customers, but the added expense left the firm with no cash and close to bankruptcy in 1989. Hired by Egan in 1988 to fix this product quality crisis, future CEO Mike Ruettgers believed that this event was a defining moment for the firm's customer service commitment as many of the affected customers remained loyal customers for future EMC products.

Although in a vulnerable financial state, EMC continued forward with a new external data storage product called Symmetrix that was introduced in late 1990. Targeted for the more-demanding IBM mainframe market, Symmetrix became EMC's flagship product line and the focal point of its business model during the 1990s. IBM dominated the enterprise storage market in 1990 with 76.0% market share. EMC was barely on the radar with 0.2% market share. By 1995, the success of Symmetrix had positioned EMC with 40.7% market share compared to IBM's 36.9%. While technological innovation was a key part of the Symmetrix success, its value capture routines within the Sales and Customer Service organizations enabled the firm to perform and deliver at a consistently high level (Porter, 1996; Siggelkow, 2001,). In 1992, EMC sold its legacy memory board business to Cambex and began to focus exclusively on the Symmetrix product line.

4.1.2 Business model

Across the periods, the business model is examined through its position in the value capture framework highlighted in Figure 1 and how the system of organizational routines to support that positioning was affected. In this first period, the baseline of the business model is established.

4.1.2.1 Value capture framework

EMC's approach to value capture was implemented via a product-service business model that was common for the industry. The baseline was established once EMC developed its first

memory board product in 1981 and remained rock solid well into the 1990s. The focus of the firm's

value creation efforts remained due to technological innovation within a small line of hardware

products. The products were competitively priced and came bundled with a standard product

support agreement. However, the emphasis in the EMC context was that customers paid for the

product (fee) and the product support was free. For example, a 1999 analyst report from Madison

Securities states, "While EMC charges higher prices for its products, customer service is free." One

former vice president put it simply, "At EMC, Customer Service was free." This way of describing

the product-service "bundle" was consistent across analyst reports and interview respondents. In

order to support this business model approach, the Sales and Customer Service organizations

represent the baseline of the primary value capture activity system examined in the current paper.

The business model changes examined in later periods affect the interactions with these two

organizations more so than manufacturing, marketing, and upstream product development

organizations. As EMC grew during this period, these organizations established a set of

organizational routines that were predictable, recognizable, and stable. These routines were deeply

imprinted and replicated through training and in practice as new employees joined the firm

(Stinchcombe, 1965).

4.1.2.2 A system of organizational routines

Direct sales account management. With its founding as a manufacturers representative business

and the IBM entrenchment within the Symmetrix target market, EMC developed an aggressive

direct sales organization. In the 1990s, the sales force was mostly male and many were former

collegiate hockey and football players once described as "a bunch of ex-athletes running through

walls at 100 miles per hour" (Judge, 1999). Sales training was a structured, 90-day boot camp where

everyone was socialized on the basic principles of selling within a competitive EMC sales culture.

While the bottom performers were fired every quarter (i.e., selected out) based on a stack ranking

evaluation system, the sales compensation system offered generous incentives as one sales manager describes, "[We were] printing money. We really were and they incentivized us heavily." See Appendix Table A3 for further evidence of the routines within the Sales organization.

Customer service. Following the 1989 crisis, the firm developed a commitment to quality and customer satisfaction that permeated throughout the customer service organization. EMC Customer Service was well respected by both the Sales organization inside the firm and customers outside the firm. Customer service was managed as a cost center – referred to by EMC staff as an *investment center* – where the cost to provide customer service was bundled into the price of the Symmetrix that included pre-sales support, installation, and a three-year warranty covering after-sales support. Near the end of the warranty cycle, the account manager would encourage customers to upgrade to a new model as one former planning manager explains, "The goal was every three years, [the Symmetrix] was upgraded and traded in so [we] didn't need to worry about selling services." While customer service was an integral part of the Symmetrix business model, the intent was never for service to be a direct mechanism for economic value. This was effectively a free resource available to customers without additional charge and to sales reps without the need to share commissions. One analyst describes, "EMC differentiates itself from its competitors with distinctive customer service. While EMC charges higher prices for its products, customer service is free. EMC's reputation as being fanatical about keeping customers happy is legendary in their industry." See Appendix Table A4 for further evidence of the routines within the Customer Service organization.

In many ways, the Sales and Customer Service organizations became institutionalized with very distinctive identities and reputations known well inside and outside the firm (Selznick, 1957). The set of routines within these organizations persisted across many years of growth, thousands of new employees, and perhaps thousands of former employees that were selected out of the firm.

4.1.3 Outcomes

As IBM and STK continued to postpone the release of their disk array products during this period, EMC continued to deliver incremental innovations to the Symmetrix product line. Moreover, EMC demonstrated its ability to deliver value to and capture value from owners of IBM mainframe platforms. The Sales and Customer Service organizations continued to show a successful and internally replicable model of customer account management and distinctive product support. From an individual level, organizational members worked within a structure that was respected and effective.

EMC nearly went bankrupt in 1989. By 1994, it had rebounded on the success of the Symmetrix disk array that was the first disk array product for the IBM mainframe platform. IBM and STK faced repeated product delays that resulted in EMC enjoying a three-year first mover advantage. By 1994, EMC annual revenues exceeded the $1 billion mark with operating income of 25.4%. The firm had tripled in size between the launch of Symmetrix in 1990 through 1994.

While the firm was riding the momentum of Symmetrix demand, IBM and STK finally launched their disk array products in 1994. Each began to signal a willingness to compete on price and gain market share. IBM was in the middle of a crisis as new CEO Lou Gerstner arrived in 1993 and perhaps they were more occupied with a declining mainframe business (Bresnahan and Greenstein, 1999). Yet, one could not count them out as even a downsized IBM had 219,839 employees and numerous technological resources in 1994 compared with EMC that had only recently grown to 3,375 employees with one hit product. Despite the long delays, STK's Iceberg disk array was recognized as "the hottest innovation in the high-end computer market" in 1994 by InformationWeek, an industry trade magazine.

4.2   Extension: EMC Professional Services (1995-2001)

4.2.1 Technology strategy

The tension for EMC management became balancing the Symmetrix momentum in a

declining IBM mainframe market with the projected emergence of client/server computing (also

known as open systems). EMC market share surpassed IBM in the highly profitable, yet declining

mainframe storage market in 1995. CEO Ruettgers pushed the firm to get serious about the less-

profitable, yet fast-growing open systems storage market. Unlike platform vendors, EMC took

advantage of its flexibility as a third-party provider and made Symmetrix capable of running on

mainframe and open systems platforms. This cross-platform positioning became known as

enterprise storage. However, the enabler of sustained Symmetrix premium pricing during this period

was the emergence of its Symmetrix software product portfolio. The first product released was the

Symmetrix Remote Data Facility (SRDF) and this software enabled disaster recovery and remote

backup solutions. The Sales organization came to love this idea because the software also required

purchase of an additional Symmetrix. With the emergence of the Internet, EMC as well as other data

storage providers began to explore networked storage solutions.

4.2.2 Business model extension

As competitors entered the disk array market, EMC managers looked for ways to

differentiate the Symmetrix offering. Although the Symmetrix was a hardware product, it included a

lot of software functionality that was included as a bundle. EMC managers decided to unbundle the

software and productize various features as separate optional line items. The first was SRDF. One

director suggests that this was the primary trigger for pursuing a professional services extension to

the business model:

> *"They felt that there would be value added to the customer and to EMC by having a*
> *professional services organization own the planning, installation, and design of these software*
> *products. The software products were fundamentally to build barriers to entry. They only*

worked with EMC products. Think about it. It was mirroring, which meant everything was being replicated. The more software you bought, the more hardware you needed."

A major concern was that the software would be sold but not implemented at the customer data center. Without the final EMC-specific software implementation, Symmetrix was an easy to replace disk array product. Explaining further:

"It was a barrier to entry play to really make sure that the software is going to get sold. The EMC sales guys would say 'You're buying all the Symmetrix [units]… for another $100,000 buy SRDF, buy MMTF, buy the backup system… Another few hundred thousand dollars on your $5 million order. What's the big deal? Help me out. I'm the poor sales guy. You may not need it today. You'll need it tomorrow and this way you'll have it. I won't charge you for maintenance until you start using it.' The worst thing for EMC was for that software not to be installed and to just sit there. That was a big concern… And until it got installed, setup, used, and integrated into the fabric, you lose the barrier to entry."

Secondarily, the emergence of distributed open systems platforms created more complex installations than the centralized mainframe model. As the Internet began to take shape, network-attached storage options also created more complexity in data storage deployments. One former VP suggests that this learning also found its way to the executive ranks:

"As it was explained to me when I was interviewing in 1995 with Jack Egan, there were three areas they were interested in… One was building a Professional Services organization… Here we had a [presales support] guy go out making a sales call, next thing you know he's in doing what we would call a storage assessment. If you would sell a distributed storage product, you had to go out and figure out all of the different devices and how you were going to connect them all. [Customer Service] would do this for no charge. Somewhere between the three of them [CEO Mike Ruettgers, EVP Sales & Marketing Jack Egan, and SVP Customer Service Dan Butler], they said, 'Hey, wait a minute this is a line of business. We need to start charging for it."

If the trend of distributed systems continued to play out and if demand could be generated for the Symmetrix software products, then this type of new world would put undue stress on the cost structure of the current business model. Yet by the end of 1995, EMC was celebrating its overtaking of IBM in the mainframe storage market.

4.2.2.1 Value capture framework

Figure 2 highlights the intent to add professional services as a fee-based services offering. While professional services within the IT industry were available from large specialized firms such as

Accenture, Computer Sciences Corporation, and EDS, this would be a new type of business for EMC. In comparison to IBM Global Services, EMC was starting from scratch. EMC had developed a successful business model that included a strong identity of Customer Service as free. Professional services would enter as an interdependent hybrid offering: fee-based like a product and use-based as a service.

4.2.2.2 Process of routinization

Given the triggers cited earlier and the intent to build a professional services business, EMC began the process of formulation and implementation of the new business. The current study examines this as a process of change to the system of organizational routines. Figure 3 shows the process as a series of three stages: formulation, a formal announcement, and implementation. This process of routinization concerns the effort needed to establish the new professional services routines and the appropriate linkages within the existing system of routines in sales and customer service (Taylor and Helfat, 2009). An organizational routine is established once three characteristics are evident: predictable, recognizable, and stable. Predictability refers to the repetitive nature of the routine. Stakeholders who need to activate the routine will understand clearly and distinctly what the outcome will be. There are no surprises and thus the risk of activation is low. Recognizability refers to the level of awareness and acceptance by stakeholders. When conditions are right, stakeholders are aware that routine activation is available to solve a problem. Stability refers to the state of the supporting infrastructure that may be organized inside the firm, outsourced to external partners, or structured within a hybrid arrangement (Williamson 1975). The emphasis here is on understanding the process to develop a stable and repeatable set of routines (Nelson and Winter, 1982) rather than on whether this was a bottom-up, top-down, or dynamic process for creating competitive advantage (Mintzberg and Waters, 1985; Sirmon, Hitt and Ireland, 2007; Teece, 2007). The evidence suggests

that the primary drivers of competitive advantage at EMC existed in managing the technological

resource base in the upstream product development stage.

4.2.2.2.1 Formulation

Managers hired from outside were given the responsibility to formulate a plan for

professional services by EMC. From an internal perspective, EMC had no prior experience

monetizing services. The modest revenues from leasing and extended maintenance contracts were

provided on an ad hoc basis. EMC did not possess the administrative systems, financial models, or

human resources who understood the organizational routines needed to operate a professional

services business. To build, EMC would need to start from scratch. One director explains:

> *"We had no [fee-based] services, no consultants – nothing. It had to be built from scratch because we didn't sell services. There was no services revenue or financial model from which we could build. It all had to be created… Recognition of revenue is very different from the way you do it in a hardware company… We had to create a project accounting system so we could track consultant time. There was none of that in the company."*

Although the firm acknowledged its lack of managerial experience in this area, some

managers hoped that the new initiative could leverage the existing customer service function and

simply add a price mechanism. The planning team promptly dispelled that perception and clarified

how professional services required different operational routines than what currently existed in the

customer service organization. One former VP describes the situation:

> *"Initially the thought was… we have all these sales support guys. We're charging nothing for them today, so tomorrow we're going to charge $200 per hour and send them in. That's where I drew the line. That's what DEC tried to do. It didn't work because people are not like products. You can't just paint them blue, call them new and improved, and [hope that] people don't know there's a difference… It's a different delivery model... [The] sales support guys were engineers that wore suits… They were very specific to what you wanted them to talk about. But as a sales guy, you weren't about to leave him behind for any length of time… It required a different…technical talent to be able to understand the technical issues [and] who wanted to be client facing. Not necessarily a sales guy, but closer to a technical sales guy than a technical engineering guy."*

The focal point of the mission and business model during the 1990s was Symmetrix storage

array hardware sales – what informants often referred to as *selling boxes*. One former planner who

joined EMC in 1996 to help plan the new initiative described it as follows, "EMC at the time was a very box-oriented, hardware-oriented company." While the professional services initiative was established to extend the business model, the evidence suggests that the initiative was not a signal of strategic renewal into a professional services firm as has been seen at firms like IBM and Unisys (Gerstner, 2002; Harreld *et al.*, 2007; Agarwal and Helfat, 2009; Lavie and Singh, 2012). This distinction matters for how resources got mobilized for this initiative. The following evidence illustrates how professional services began as a small, experimental effort whose future remained uncertain. The uncertainty was relative to how the initiative would fit within the EMC box-focused culture and business model. One former planner elaborates on this uncertainty expressed to him during a conversation with CEO Mike Ruettgers:

> *"I remember asking Ruettgers about the culture of the company and about how open they would be to accepting this new concept… Services are intangible and soft…You can't put it in a box… He said, '…This will be a challenge because I don't know yet if as a company we're ready for this, but I know it's something we need to do.'"*

The planning team needed to understand how the new professional services business would affect the interdependencies among the existing business model routines in sales and customer service and where to form the appropriate interorganizational linkages required to develop operational consistency (Taylor and Helfat, 2009; Gupta, Hoopes and Knott, 2015). The Professional Services initiative was intended to complement the existing Symmetrix hardware and software product related activities (Teece, 1986; Milgrom and Roberts, 1995). While the new initiative needed to be connected with the Symmetrix business model activities, professional services were to be a loosely coupled set of activities not necessary in every Symmetrix sales transaction. Nevertheless, the key linkages to be developed were with the Customer Service and Sales organizations.

As a services initiative, the planning team was concerned that professional services needed to be clearly and carefully differentiated from the existing customer service approach in order to avoid

confusion. The planning team positioned the new professional services business as a for-profit consulting business rather than the existing for-free customer service business. While structuring this as a service initiative for the firm, the planning team was mindful not to let professional services be overshadowed under the customer services structure. One former director explains, "They didn't want it under Customer Service because they felt that it would get hidden under the free customer service umbrella." While generally supportive of the idea, customer service managers were concerned with how quickly the new organization could be staffed and trained without creating larger support issues. One former planner describes the supportive reaction from customer service and product management personnel:

> *"I didn't have a problem convincing the [customer] services people there was an opportunity here… I didn't have any problem with product management and product marketing people because intuitively they knew that if there were a way we could wrap more value around what they were delivering to market, we would sell more boxes."*

By adding a professional services option into the Symmetrix business model, the new initiative needed to be integrated into the sales process. The intent was to build upon the existing sales routines for the limited situations where professional services would be of value to a customer. The Sales organization *owned* the customer account relationship and they were the gatekeepers to the customer. Sales expressed the greatest resistance to the new initiative during the planning phase. One former planner explains:

> *"The guy running [US] sales was the toughest [to convince]. Once we convinced him that it was going to report to him and we were going to hire a managing director who had experience working with sales people and would become a part of his team, he was more accepting of it. I still come back to this concept that the EMC sales force at the time… was cut throat... That was the mentality. I remember at the beginning of the [planning] process… I had sales account managers look at me and point their finger at me, 'If you touch my account without telling me, you're dead. You're dead.' That's when I went back to […] and said, 'What did you get me into here?'"*

One concession made was to structure the new initiative under the Sales organization with the intent to quickly develop a mutual understanding going forward. One former VP describes the importance of aligning with the Sales organization:

> *"Because of the culture; we wanted to align to Sales… Putting it in Sales says, 'This is for you. This is not [free] sales support. It's a line of business. It's close to you.'"*

The tension of balancing existing commitments to investors with responding to future trends is likely to shape the level of resources mobilized for an unproven initiative. One former planner elaborates:

> *"At that [early] point, [professional services] was a proof of concept. If you're a Wall Street firm and you're being measured by how many boxes that you ship, part of us said cautiously, 'We don't want to mess with the goal sheet and have these guys take their eyes off the product box goal and potentially miss our number.'"*

The Professional Services initiative began with a pilot test phase in 1997 as staffing levels were increased primarily through external hiring. The firm's lack of experience in this area created a high level of uncertainty and, therefore, the pilot test phase enabled the firm to experiment and fine-tune the new practices. One former planner describes the introduction as a soft launch:

> *"According to Mike Ruettgers' plan, we didn't do a blast into the market. It was a soft launch. We couldn't generate too much demand [because] we didn't have capacity to deliver. The services were not tested. They were new… [so there was] no big Mike Ruettgers interviews or anything like that… We hand picked a couple of pilot accounts… whose account managers were positively predisposed to working with us on this... We tested the assessment service. We uncovered some holes and patched those to make it a more robust offering."*

The planning team spoke with industry analysts about the new initiative during its early stages. One PaineWebber analyst commented in a June 1997 EMC report on the small staffing level but understood the initiative's future intent:

> *"...expand EMC's professional services organization (i.e., consulting, systems integration, systems design), which will become more important as EMC introduces more network-attached storage devices that require careful network planning. Today this effort numbers less than ten people."*

The formulation phase was itself a process that initiated in late 1995 and extended into 1997 with pilot testing in a few customer accounts.

4.2.2.2.2 Change event

Following a pilot test period, a formal launch announcement was released over the business wire in early 1998. While firms have communication staffs that specifically write the content, it is interesting to note that the endorsers quoted within the announcement were the top manager from the professional services team, a customer from the pilot test, and CEO Ruettgers. The formal announcement described three professional service practices available from the EMC consultants: storage architecture and design, backup and recovery, and disaster recovery. In the announcement, Ruettgers explained the need for professional services,

> *"Our customers repeatedly tell me that daily demands placed on their IT organizations make it virtually impossible for in-house staff to understand fully what information they have, where it's located and how to access it for the benefit of the business. EMC Professional Services fill that void."*

In a trade press article the week of the formal announcement, CEO Ruettgers suggested that he needed many more on the initiative, "Ruettgers recently estimated the company had 120 [professional] service workers, but could use 1,000" (Wallack, 1998).

This formal announcement period is suggestive of a key stage in the process of routinization. The announcement serves as an early signal of recognizability for both internal and external stakeholders. Perhaps as an example of satisficing (Simon, 1947), managers at this stage have developed an ostensive vision of professional service routines with a basic structure that within reason can be fully implemented (Feldman and Pentland, 2003). Professional services had yet to reach the mature stages of predictability and infrastructure stability as a set of routines within EMC.

4.2.2.2.3 Implementation

The implementation rollout stage was iterative during this period which by the end of this temporal bracket seems to reflect the "response from selection pressures" (Cohen *et al.*, 1996 p.

683). Despite the planning effort and executive level support, the new business faced several challenges during its initial implementation: mobilization of resources, resistance from the sales organization, ambiguous organizational fit, and instability within its management team. The planning team hired an experienced external manager to build out the new organization starting from the small pilot test team. The task was twofold: hire enough people to provide minimal geographic coverage and determine how to integrate into the existing sales process. One director explains,

> *'So when I got there, there was a fair amount of planning already done. I got a playbook approximately 60% done and I had to figure out how to set this up organizationally which was complicated because I'm one guy. It's a $2 billion company. How do you find enough people with the skillsets really fast so that you can actually convince people that you can get this job done? The hardest thing was it's a new organization viewed as competitive to Customer Service [and] confusing to Sales. Sales had marching orders and strict quotas. [They'd say,] "Get out of my way. Get the f out of my way." How do you scale it globally fast? That's hard.'*

The biggest challenge was integrating into the sales process. The sales account managers perceived professional services as lengthening the sales cycle and hence slowing down the time to close a deal. Therefore, the new business was viewed as a big risk to the existing sales goals. One manager explains,

> *"The challenge frankly wasn't in selling to the customers. The challenge was credibility within the EMC sales organization."*

One VP describes how the new organization was nicknamed the *sales prevention team* by some sales reps,

> *'The sales guys viewed the professional services organization as a deterrent. They called it the "sales prevention team." It was viewed as elongating the sales cycle that they were measured on. They said, "I can sell $200,000 of services, but I will be fired because I'm being measured on pushing boxes."'*

Although the new opportunity received buy-in during the planning phase, the sales personnel in the field as well as regional sales management were reluctant to embrace the idea during the rollout. One director explains,

> *'I sat with the director of [US] sales [who was] a very powerful guy. He ran the show. He ran the show… He was essentially on an organization chart my peer although it wasn't even close*

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and I understood that. I started in March. I didn't meet him until June or July. He sat down the aisle from me. I tried to meet him. I tried to get invited to his staff meetings. [I would] get uninvited at the last minute by his operations guy. Finally one day I go in and we finally have a meeting. He closes the door and he says to me and this is verbatim, "You are the number one risk to me making my numbers this year. You measure a man by the amount of money he makes and you are the biggest risk I have." [I said] That's not my intention. My intention is not to get in your way but to really try to add value with what the customers are trying to accomplish with the products. [He replied] "You're not on my radar. You're not getting on my radar. Good luck." ... We had a very cordial relationship... He was friendly... It was never a personal thing.'

The process to develop credibility with the sales team was long and slow. During the early stages, the tension between aligning incentives and providing adequate geographic scale to deliver the services was a difficult dilemma. One director explains,

'In the first year, I needed to have the shape that aligned with the field organization. I needed to … get our metrics aligned and integrated with the rest of the businesses… At the time there were eight regions… I was measured on how quickly I could put the team in place. You're not going to generate a nickel of revenue until you have people who can deliver it. So I spent the first nine months building this team. I hired about 100 people and that was a full-time job in itself... In some regions we were able to roll out and get some scale. Some regions wanted no part of it. I had to get buy in from the regional managers [but] half wouldn't give me the time of day.'

A regional manager who worked as a sales support systems engineer during this period suggests that he and many of his colleagues simply performed the complex implementations under the free customer service model. Given the spotty acceptance within the sales regions, the resource levels in the supporting professional services infrastructure were inconsistent. Therefore, many staff in the field continued to work under the existing customer service free model:

"When I started here in 1999, the thing that intrigued me the most...it was a hardware product company with a couple of software [products] – TimeFinder and SRDF. It was all about the [hardware] product. A guy who use to work for me at [a previous firm]… was interviewing for a job in Professional Services. [He asked me,] 'Could you get me in?' We have professional services? Yeah, we've got four guys that work in the office upstairs. Four guys for the entire northeast – New England, Ohio, and all of Canada. Looking back, we didn't sell a lot of professional services. We just did it. The [sales support] systems engineers did the work. It was just considered part of the sale."

Integration with the sales force slowly developed through a bottom-up process rather than from a formal top-down mandate. Acceptance emerged from a grass roots effort as Professional

Services members sought out account managers willing to consider the new opportunity within their

customer accounts. One manager likens this experience to that of a missionary,

> *'It was very similar [to being] a religious missionary… You want to find … [a sales rep]*
> *that's at least willing to listen to you. The thing I would always say is, "Listen, I have an*
> *opportunity. This is what it does… If you think you have customers that can take advantage of*
> *these opportunities that we're providing, I'd very much like to be introduced to them and talk*
> *to them about this. You own the account. I'm not going to do anything in there without your*
> *explicit permission." A lot of them said, "Nope, not interested." A couple of them would go,*
> *"Well I do have this one customer… I've had zero success in there. Maybe I'll bring you in on*
> *the next sales call."'*

While the original intent was for professional services to be a revenue-generating business,

the sales teams would often revert back to the free service model. In the beginning stages, the sales

reps avoided charging existing customers for the new fee-based services in exchange for a smooth

product-focused sales transaction. One manager explains,

> *'I [had to] throw in services for free. People were very afraid and so as a result they didn't*
> *manage that aspect of a particular sales cycle with a particular customer very well. They*
> *didn't know how to… It was nothing underhanded… [The sales rep was] concerned about the*
> *margin on traditional hardware sales. If they can do anything to enhance that and get them*
> *over the line… quarterly pressures, etc. [They'd say to the customer,] "Here's what I'll do. I'll*
> *throw in a services aspect in this for you." And they didn't get dinged for it. Early on, we're*
> *just trying to get a toehold.'*

Organization structure and roles were modeled after the technology service organizations at

the large accounting firms. The first leader of the organization had a title of managing director

although later managers had the title of vice president. One director explains,

> *'Organization wise, we tried to model after the Big 5. The whole notion of managing director*
> *was a brand new title [within EMC] back then. No one had a title like that. They didn't want*
> *to give me a VP title, but they wanted to give me something that sounded like it had some*
> *juice. Not only was it a consulting title, but it was also an international title. So the guys from*
> *overseas when they heard "managing director" … that's an important job… We didn't have*
> *partners per se. But organizationally, some of the roles were similar to what you would find in*
> *a Big 5. EMC always viewed itself as very unique. We took what we thought worked at places*
> *and adjusted it to fit the EMC culture as best we could.'*

From a structural perspective, the new organization began under Sales but was soon moved

under Customer Service. By 2000, the 600-person organization had enough scale to be its own entity

alongside of customer service. Within a strong product dominant culture, the emergence of

professional services was bumpy starting with the resistance from the sales organization. In addition,

the new organization's top management fluctuated between outsiders familiar with professional

service practices but not well versed in the aggressive EMC culture and insiders familiar with the

EMC culture but not well versed in professional services. One manager describes the rate of

management turnover within the new organization:

> *We had multiple vice presidents of [professional] services and it was more a title than an actual… Some of these folks couldn't spell services. Some could, but [they] didn't get the culture… It was a parade [of managers]. Honest to God, it was a parade.'*

The time to acceptance varied across the sales regions. In regions that were early to embrace

the opportunity, one manager explains how credibility developed from bottom-up and top-down

mechanisms,

> *'Now I'm in a mode where people aren't asking to bundle services into the deal and give it away. Now we're into a mode where the reps are accountable as well… They now knew that there was a team of people in my region and the other regions that were delivering success and were helping them in opportunities. They got to understand that [the professional services people] were in the account and they're shoulder to shoulder with [the customer's] staff on a daily basis… spending time and going out to lunch with these folks and … picking up on little things. They're bringing opportunities back that the reps had never sniffed out on their own before. It was a different type of relationship, a different level of relationship. Where the reps, district managers, and area managers understood this synergy and exploited it, they were the ones that accelerated very quickly. Then you had corporate [sales management]… saying, "Hey, this services stuff… has all these benefits. Sell it." Now they're hearing it from the top and they're seeing the success from the bottom.'*

4.2.3 Outcomes

This time period concludes with EMC reaching its peak performance in 2000 when

examined across multiple metrics including annual revenues, operating margin, net income, number

of employees as shown in Table 1. EMC was the fastest growing stock of the 1990s on the New

York Stock Exchange. Despite increased competition in this space, EMC maintained an ability to

charge premium prices in large part due to the emergence of its Symmetrix software product

portfolio that itself reached $1.4 billion in 2000. The new professional services business played a

very limited role in the success. The selection pressures were intense on this new organization. The

supporting infrastructure was stable. The structure shifted from under Sales to under Customer Service to eventually a standalone entity within the EMC Global Services structure that formed in 2001. The resource levels were 100 in early 1998, 300 in 1999, and 600 in early 2001. Management turnover was high at the top levels of the new organization. Given the confusion of the hybrid offering, the strong imprinting of the free customer support model, and the inconsistent resource levels, professional services did not reach a mature level of routinization. While informants suggest that the new organization could deliver a quality work product, the unstable infrastructure and the inconsistent recognizability indicate a low level of frequency and repetitiveness. The organizational structure began to stabilize in 2001 as a standalone entity within EMC Global Services.

This temporal bracket period ends in 2001 during the dot-com economic downturn. The optimism of the Internet continued into early 2001. After serving one year as President and COO, Joe Tucci became the third EMC CEO and Mike Ruettgers became the Executive Chairman of the Board. Ruettgers and Tucci projected 35% revenue growth from $8.8 billion in 2000 to $12 billion in 2001. Although competitive storage arrays had caught up and in some cases surpassed Symmetrix, EMC management believed that the combination of Symmetrix hardware and software would facilitate continued growth.

4.3 Split and extend: EMC Consulting (2002-2010)

The confidence expressed to analysts in early 2001 soon turned into a worst-case scenario across 2001 and 2002. Customer buying behavior radically changed as most began to hold off on IT purchases. The 9/11 terrorist attacks crippled two major EMC customer segments – financial services and the airline industry. As the size of the market shrank overnight, the competition between EMC, IBM, and HDS intensified. Customers no longer felt compelled to pay the EMC premium given the competitiveness of the latest IBM and HDS storage arrays. As a sign of the times, EMC management slashed prices in an attempt to maintain market share. Fewer Symmetrix

unit sales coupled with much lower average selling prices resulted in massive losses. Although Tucci and his senior management team initiated major restructuring efforts in late 2001, financial performance continued fading into 2002. See Table 1 for details. The EMC stock price plummeted from 103.25 to 3.83 between September 2000 and October 2002.

4.3.1 Technology strategy

Given the deep-rooted industry shock, senior management had to rethink the technology strategy as well as the business model. The world had changed. EMC core competence emanated from the Symmetrix storage array product line. With competitive storage arrays now on par with Symmetrix, risk averse customers were now less likely to fund large storage projects – the sweet spot of Symmetrix. The firm began to take the CLARiiON disk array product obtained in its 1999 acquisition of Data General more seriously as its modular design provided customers with the flexibility to add storage capacity in small increments. In a November 2001 restructuring, hardware engineering was reorganized into one organization with management oversight for Symmetrix and Clariion product lines.

With a weakened Symmetrix business, the EMC-specific software strategy – although growing quickly and with high profit margins – was equally vulnerable. Prior to the dot-com crisis, EMC was reluctant to join industry multi-vendor efforts to create interoperability software standards given the success of its Symmetrix-specific approach. In an attempt to shift towards a multi-vendor software strategy in late 2001, the firm initiated its own software platform efforts with Automated Information Storage (AutoIS) and WideSky. However, competitors were reluctant to join EMC-led efforts and hence both platform strategies failed (Saghbini, 2005).

In the November 2001 restructuring, the software organization was removed from under the Symmetrix organization and made into a standalone business unit. This was yet another sign that EMC management was serious about moving beyond its past Symmetrix-specific software approach.

Tucci announced his 50/30/20 plan targeting annual revenue contributions of 50% from hardware, 30% from software, and 20% from services. At the time, contributions were 66%, 23%, and 11%, respectively.

4.3.2 Business model extensions

The dot-com market shock also became an occasion to reexamine the business model. While CLARiiON plugged a gap in the storage hardware portfolio, its small price tag was not a good fit for the well-compensated direct sales force. In a major sales strategy shift, EMC signed a five-year reseller agreement with Dell for the CLARiiON product line in October 2001. Otherwise, the direct sales model persisted. The professional services organization began when the Symmetrix hardware business was healthy and the Symmetrix software business was emerging. Following the dot-com market shock, the strategic intent for professional services was reevaluated within a radically different context marked by a weakened Symmetrix hardware business, the uncertainty of a multi-platform software strategy, and the erosion of premium pricing.

Under the leadership of CEO Joe Tucci, senior management concluded during the assessment that EMC needed a professional services position. Senior management communicated this belief to analysts in early 2001 and the thinking remained consistent during the dot-com crisis. A Buckingham Research analyst reported the EMC senior management belief in early 2001, "The shortage of IT professionals means a significant opportunity in professional services (EMC plans to double personnel in 2001)." However, the new thinking was that professional services needed to be split into two categories: implementation services and consulting services. The initial professional services organization was becoming recognized for its EMC-specific implementation service routines although the original thinking in 1997 was to position the initiative as consulting services. One regional manager confirms, "We didn't have that consultative bend. We had implementers." However, implementation services needed more scale.

To align with the industry-level, platform agnostic software positioning, senior management believed that EMC needed an analogous *non*-EMC-specific consulting position. Given the admission of a failure to build a true consulting organization from its earlier initiative, the challenge would be how to develop this position.

4.3.2.1 Value capture framework

Figure 2 highlights the intent to continue with professional services and add consulting services as a fee-based services offering. Professional services would continue as an interdependent hybrid offering: fee-based like a product and use-based as a service. Yet, consulting services would begin as a hybrid offering but independent of the product sales cycle.

4.3.2.2 Process of routinization

4.3.2.2.1 Formulation

The decision to split fee-based services into two initiatives meant that the previous professional services business would continue forward with a narrow focus on EMC-specific implementation services. That business did not consider non-EMC implementations, but the quiet goal was to be a consulting business. The latter was abandoned. One consulting VP contrasts the two service initiatives with respect to a product sales cycle:

> *"Professional services as we define them are implementation services [that]… follow the product [within existing accounts]… Whereas with consulting, the sales cycle is totally independent of the product sale."*

The time to develop predictable routines in consulting was on a much shorter leash than the professional services initiative in the 1990s. Unlike its tendency to internalize strategic activities during the growth of the 1990s, EMC management pursued an outsourcing agreement with an established consulting services partner. One VP explains:

> *'[Information Solutions Consulting] was a white labeled outsourcing arrangement where Accenture badged people were dedicated to a group within Accenture that was focused 100% on EMC… They were the consultants that went out everyday into clients and said, "Hey, we're here representing EMC…" Even before [ISC], EMC tried … to organically build a*

*consulting team. That's hard to do... which is one of the reasons that they partnered with
Accenture to go try and do something creative around how do we build [consulting] now.'*

4.3.2.2.2 Change event

In July 2002, EMC made a formal business wire announcement of its new Information
Solutions Consulting initiative. In comparison to the EMC Professional Services initiative that
included two years of planning, hiring, and pilot testing before a formal announcement, the
consulting initiative was done within one year and did not include a pilot test phase. The
endorsement quotes in the formal announcement were from a division-level CEO at Accenture, an
industry analyst, and the senior vice president of EMC Global Services who positioned the initiative
as follows:

> *"We are developing an open, platform-independent services strategy that will complement
> EMC's delivery of the world's most open networked storage solutions… We are now
> developing a full range of consulting services for heterogeneous storage environments."*

The redefinition of the earlier EMC Professional Services business was not announced in a
separate formal announcement. However, the Information Solutions Consulting included a signal to
flag the recognizability of professional services relative to consulting:

> *"The new services will be offered separately from those provided by EMC's existing 1400-
> strong professional services organization that focuses on EMC-specific technology."*

Of note, the consulting initiative was positioned separately from the EMC product sales
cycle but was intended to be a complement to all EMC business.

4.3.2.2.3 Implementation

The refocused professional services initiative was restructured to combine some sales
support personnel with the existing professional services staff. This solved some of the reported
inefficiencies between the scoping and implementation phases of complex projects. One VP shared:

> *"You'd have a pre-sales engineer who would effectively throw things over the fence. The
> [professional services] delivery guys were measured on a separate P&L … who would take
> that and say, 'Hey, I can't deliver this. You didn't scope it right. This is too hard. There's not
> enough money in this for me.' It just created all kinds of hate and discontent…"*

That restructuring stabilized and remained in place at the time of the interviews. One sales

manager describes the transition period needed to get customers used to the idea of professional

service implementation fee:

> *"It became, ok guys the next time you sell them $500K do me a favor. Do the deal, get the handshake but when you go back say, I need your help here. I gotta show… and over time we just wore the customers down. Listen, it's still $500K but it's going to be $490K and $10K or $470K and $30K or whatever… Now it's become… it's pretty much second nature. It took a while though. It wasn't overnite. It was definitely a multi-year process."*

As EMC continued to develop positions in multiple software technologies during this

period, the range of integrated solutions increased dramatically. Gone were the days of a simple

Symmetrix plug in to an IBM mainframe. Also, gone were the days of "get out of my way" from the

Sales organization and even the customers became accustomed to EMC monetizing implementation

services on complex deployments. Selection processes had finally stabilized the professional services

routines into legitimate, predictable, and recognizable organizational entities.

Information Solutions Consulting did not begin with the same intraorganizational

implementation hurdle experienced with the earlier professional services initiative. EMC conceded

their lack of consulting know-how and outsourced the managerial coordination effort to the experts

at Accenture. Both firms believed that contributing 100 employees to the new effort were enough

resources to have a reasonable scale that was immediately structured to be functional. EMC

contributed employees with data storage technology expertise while Accenture contributed

employees well versed in consulting operational routines and consulting managerial expertise. By late

2004, Information Solutions Consulting had grown to 350 consultants.

Established as an independent initiative under the loose oversight of EMC's services

division, Information Solutions Consulting required minimal interorganizational coordination.

Therefore, the system of routines supporting the EMC product business model was not affected.

Accenture provided the legitimacy for predictable and recognizable consulting routines. However,

the demand was lower than expected and the ability to optimize the consulting initiative in the best

interests of EMC was difficult through an external partner. Competition from small boutique

storage consulting shops also began to trigger the need for a more internalized version of consulting.

One analyst shares:

> *"And that was in response to a third-party industry that had grown up doing storage consulting… [These storage consulting firms] would go consult to a data center, CIO, or whatever and say here's what your strategy should be in terms of how you plan for storage, how you architect it, and then all conceptual and to a degree technical... Ultimately it would end up in some purchasing transaction, but all the consulting was being done mostly by other people. We used a lot of partners to do that like Accenture's a good example… But we decided along the way that we wanted to bring a large amount of that capability in house."*

Therefore, EMC began to transition towards the development of an EMC Consulting

organization between 2005 and 2008. Formally, it remains independent of a product sales cycle.

Informally, there exists an implicit assumption with many staff that consulting has interdependence

– at least loosely – with EMC product sales. One consulting VP explains:

> *"Now I think we all get it because we see that a good business consulting engagement met today will yield customer loyalty, customer commitment, [and] more EMC hardware sales two years down the line."*

Consulting exists in a dynamic state that is at times independent and at other times

interdependent. On the one hand, this provides flexibility. On the other hand, this reflects ambiguity

for those who desire stability in the business model. One internal analyst describes this tension:

> *"One of the classic dynamics in a product company that has a consulting arm – is there synergy? Is there value that the consulting arm is driving for the product guys or vice versa? Or do both have their own independent business models and both generate profits but they don't necessarily have to then fit each other? It's kind of an open question."*

During this period, EMC acquired many software companies as it continued to broaden its

technology position. To support the transition to EMC Consulting, the firm acquired six small

consulting firms between 2005 and 2008. This was a gradual build up process to stabilize the

supporting infrastructure. However, EMC Consulting faced some familiar challenges in looking for

possible ways to integrate with the Sales routines. When predictability is perceived to be low,

resistance comes down to managing risk. One VP provides the perspective that predictability boils

down to the ability to deliver consistent quality at the same level as other routines within the

business model:

> *"The truth is, the issue in service is quality of delivery. We charge customers a boat load. And we're a company that deals in premiums so most customers expect the same quality from our consulting capability as they do from our product. So if we have a best in class product, they expect a best in class service… Customers come to expect a certain quality of deliverable from us and when this company doesn't deliver at that level … whether or not that's fair or unfair for the product or service that you're buying in that segment … they expect to do business with EMC. So I think over the last few years we also have seen a maturing in our consulting capabilities in such a way that they are able to engage with the salesforce and yield a good result."*

One consulting VP shares the challenges faced in coordinating activities through the Sales

organization:

> *"In consulting three years ago [2007], most sales guys would say, 'Just stay out of my way. A) I don't understand it. B) I don't care about it. C) I don't want you to risk my $5 million product deal by pissing off my customer with some $100,000 consulting engagement that goes sideways. Just get out of the way.' … We're at a point now where [sales management] … has started to see that we can create real stickiness in accounts."*

4.3.3 Outcomes

EMC survived the dot-com crisis, but not without many tough decisions. The firm grew

through many software acquisitions and survived the 2007 recession period. Yet as a technology

firm, there is no rest in sight (Grove, 1996). As shown in Table 1, firm performance improved and

stabilized although not like the high-flying days of the 1990s.

The core of the product-service business model remains intact: sell the product and provide

high-performing product support. With the addition of more software, the business model also

includes a contribution from other types of services such as maintenance and managed services.

With enterprises deploying IT in more sophisticated ways, the role of services within technology

product firms such as EMC in the IT industry has become more commonplace. However, the

flexibility of the product-service business model means that there exists lots of variation in how

deeply firms choose to commit to this course of action. Of the large firms, IBM is leading the pack while Cisco is perhaps closer to the opposite end of the spectrum than EMC (Cusumano *et al.*, 2015).

5   Discussion and Conclusion

5.1   When: boundary conditions for business model evolution

The business model literature is suggestive that technological innovation is a separate construct from the business model (Teece, 2010; Baden-Fuller and Haefliger, 2013). The business model mediates the relationship between technological innovation within the firm's strategy and firm performance. In high-velocity industries, technological change is a mechanism for proactive first movers that often forces incumbents into a defensive posture as they react to protect established strategic positions. What is less clear is the nature of the relationship between technological innovation and the business model.

The current study confirms that there is a link between technological innovation and the business model. However, this link is not coevolutionary in nature. As EMC introduced multiple memory board products on various proprietary computer platforms and introduced disk array products on proprietary IBM mainframe and open system (Unix and Windows NT) platforms, the business model design persisted. Despite technological changes at the industry level and an evolving technology strategy within the firm, the basic business model positioning within the value capture framework and the substance of the organizational routines to sell and support the products did not change. While EMC demonstrated dynamic capabilities that altered its technological resource base (Teece *et al.*, 1997; Eisenhardt and Martin, 2000; Sirmon *et al.*, 2007), the business model was a static set of stable, predictable, and recognizable routines. The concept of the routine as replicated organizational memory seems evident as new resources were added to expanding the Sales and

Customer Service organizations through 1995 (Nelson and Winter, 1982; Winter and Szulanski, 2001).

The current study suggests that the link between technological innovation and the business model is contingent on the nature of the shifting structure within the firm's technology strategy and product portfolio. Although EMC's product positioning exemplified a related diversified portfolio prior to 1995, each EMC product was independent of the other EMC products. In other words, products were targeted for separate computer platforms. Where EMC had multiple types of products targeted for one specific platform, those products connected to the platform but did not interact directly with other EMC products. That began to change as the firm began to develop software products such as SRDF, which began to transform the structure of the product portfolio from Symmetrix as just another plug-compatible disk array product into an EMC-specific interdependent product platform solution deployed and communicating across multiple geographic locations. The additional software product capabilities provided differentiation from rivals. However, the solution orientation would put greater stress on the customer service "free" approach and require some nuanced changes in the sales process. This was an oversight in managerial cognition when this technology strategy was first introduced. The software was being sold but not implemented. When implemented, the customer support requirements were an order of magnitude greater than a simple install to a mainframe. The implications of this situation were recognized after a number of months and this became a primary trigger for the new professional services extension to the business model. Firms with new technologies sitting in the lab that never get deployed to the field may lose a valuable learning opportunity to understand what an appropriate business model needs to be. Winter and Szulanski (2001) suggest that a business model is fine-tuned and adjusted by "doing." The adjustment phase is suggestive of learning by doing (Von Hippel and Tyre, 1995).

Therefore, the professional services initiative became an occasion for business model evolution triggered by a structural change in the nature of the technology product strategy.

Yet, the effect of the structural change did not seem to be immediately obvious to EMC managers. After a delay of several months, input from the field began to accumulate so that EMC managers took note. The results suggest that managerial blind spots are aided by action – learning by doing in the managerial ranks. It's impossible to recognize all possible contingencies and uncertainties in real time.

Our primary contribution to the business model literature is twofold. First, we introduce the value capture framework as a way to situate prior and future work on business models. As a unifying framework, future research can begin to integrate insights and spot contingencies across the different business models but primarily as those differences exist across quadrants. Second, our study provides evidence for the organizational routine as a theoretical home for the business model. Routines can exist within the firm and across firm boundaries (Zott and Amit, 2010). Unlike the technological resource base that is the focus of dynamic capabilities and nimbleness within the core strategy, the business model is a mechanism that persists across multiple product generations and often is imprinted deeply with the firm (Tripsas and Gavetti, 2000).

5.2   How: the process of changing business model routines

While EMC managers demonstrated cognitive understanding of their situation, the decision to develop incremental extensions to its business model launched a process that took years to stabilize within an infrastructure by which predictable and recognizable routines were available. The process of routinization for professional services and consulting services are suggestive of an evolutionary process (Nelson and Winter, 1982). Evolutionary theorists posit that variation, selection, and retention are core processes by which evolutionary mechanisms work (Feldman and Pentland, 2003; Pentland *et al.*, 2011). The EMC Professional Services initiative underwent the most

significant set of internal selection pressures as resource levels, organizational structure, and management turnover were but a few of the startup challenges faced.

Prior literature on organizational routines has examined timing issues related to speed of decay and speed of executing routines (Cohen, 1991), yet we find that when new complementary routines affect the timing cycles in existing routines, team members perceive complements as substitutes. This is suggestive of a disconnect between planners and implementers or between stakeholders with different organizational perspectives. Therefore, stakeholders revert back to common practices and ignore the new routines. Overall, we believe that the business model construct can benefit from a theoretical grounding in evolutionary theory. The fact that EMC's product-service core business model of direct sales and customer support persists for over 30 years is a testament to the power of routines. Some extensions have been added, but a long legacy of path dependency prevails.

5.3   Limitations

We offer the typical disclaimers of a single-firm case study. While the EMC context is idiosyncratic, it provided a novel environment to study business model evolution through the lens of organizational routines. While the current study provided clear temporal bracketing markers, the service initiatives examined were not independent of one another. The EMC Consulting initiative builds off of prior learning from the earlier EMC Professional Services initiative. The internal selection pressures were far less aggressive than during the start of the earlier initiative.

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Figure 1. Value Capture Framework

Cost to customer

Fee

- Pay-per-use
- Rent or lease
- License
- Software-as-a-service

Product bundle
| A | B |

Customer property rights

Blade

Razor

Product

Own

Service

MSM or Freemium
- Advanced access
- Ads or sponsor
- Basic access

Use

Free
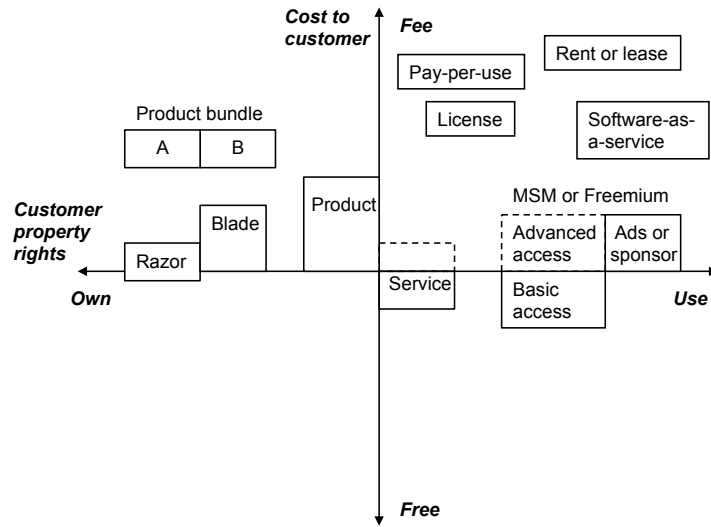
Figure 2. Evolution of EMC Value Capture

Baseline product-service business model

Fee

Products

Use

Own

Customer Service

Free

Add EMC Professional Services

Professional Services

Add EMC Consulting

Consulting
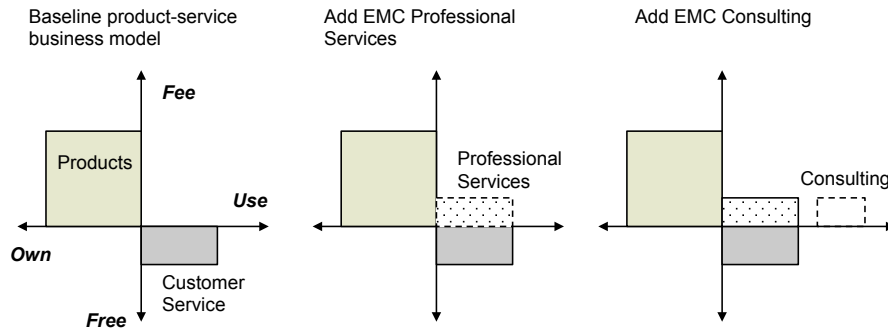
Figure 3. A Process of Routinization

Triggers

Formulation
- Organize ("make or buy")
- Time to routinization
- Startup investment level

Business model change event
- Public announcement signal

Implementation rollout
- Iterative

Selection processes

Outcome at temporal bracket
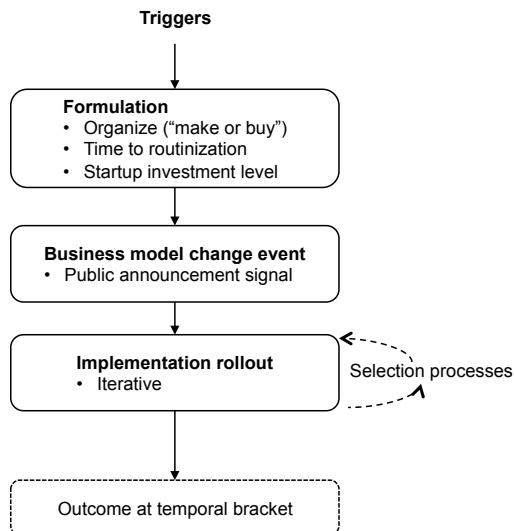
Table 1. EMC Financials.

Revenues ($ million)	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Annual	33.4	66.6	127.1	123.3	132.3	171.2	232.4	349.1	782.6	1377.5	1921.3	2273.7
% revenue growth		99.5%	90.8%	-3.0%	7.3%	29.4%	35.7%	50.2%	124.2%	76.0%	39.5%	18.3%
Product sales	32.7	65.3	123.6	117.2	123.7	159.7	220.3	334.6	757.8	1343.1	1878.2	2218.3
Services	0.6	1.3	3.5	6.1	8.6	11.5	12.1	14.5	24.8	34.4	43.1	55.4
Services / total revenues	1.9%	1.9%	2.7%	4.9%	6.5%	6.7%	5.2%	4.2%	3.2%	2.5%	2.2%	2.4%
Cost of sales and service	11.0	16.3	46.4	75.0	100.5	99.1	127.0	189.4	380.8	660.0	1002.9	1249.0
R&D expenses	1.7	4.8	9.5	10.1	11.6	14.8	18.4	28.9	59.0	117.9	162.6	161.1
SG&A expenses	7.9	19.0	34.2	48.4	45.1	48.0	64.6	82.6	162.5	249.0	320.0	367.1
Operating income	12.9	26.5	37.0	-10.3	-25.0	9.2	22.4	48.2	180.4	350.5	435.8	496.5
Operating margin (operating income/sales)	38.6%	39.8%	29.1%	-8.4%	-18.9%	5.4%	9.6%	13.8%	23.1%	25.4%	22.7%	21.8%
Net income	7.5	18.6	28.2	-7.8	-18.6	8.9	13.0	28.7	127.1	250.7	326.8	386.2
# of Employees worldwide	192	400	850	910	936	1,142	1,155	1,458	2,452	3,375	4,100	4,800

Revenues ($ million)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Annual	2937.9	3973.7	6715.6	8872.8	7090.6	5438.4	6236.8	8229.5	9664.0	11155.1	13230.2	14876.2	14025.9	17015.1
% revenue growth	29.2%	35.3%	69.0%	32.1%	-20.1%	-23.3%	14.7%	32.0%	17.4%	15.4%	18.6%	12.4%	-5.7%	21.3%
Product sales	2862.6	3791.2	5983.0	7680.9	5867.2	4218.4	4766.3	6055.1	7009.0	8078.0	9412.0	10071.8	8828.1	10892.9
Services	75.2	182.4	361.8	612.1	972.3	1078.4	1371.0	2110.7	2654.9	3077.0	3818.0	4804.3	5197.8	6122.3
Services / total revenues	2.6%	4.6%	5.4%	6.9%	13.7%	19.8%	22.0%	25.6%	27.5%	27.6%	28.9%	32.3%	37.1%	36.0%
Other (AViiON related)			370.8	579.8	251.1	141.6	99.5	63.6						
Cost of sales and service	1571.0	1929.2	3258.2	3729.8	4247.0	3319.5	4014.9	4471.1	4471.1	5241.9	6018.9	6653.8	6281.0	6984.1
R&D expenses	220.9	315.2	572.5	783.2	928.7	781.5	747.6	865.3	1022.2	1289.6	1528.1	1807.1	1627.5	1888.0
SG&A expenses	484.1	747.5	1435.5	2103.0	2214.2	1680.8	1656.2	2266.7	2606.0	3253.3	3912.7	4601.6	4595.6	5375.3
Operating income	661.9	981.8	1241.1	2256.9	-697.8	-493.8	401.2	1044.0	1048.4	1207.8	1739.3	1568.9	1414.3	2683.3
Operating margin (operating income/sales)	22.5%	24.7%	18.5%	25.4%	-9.8%	-9.1%	6.4%	12.7%	10.8%	10.8%	13.1%	10.5%	10.1%	15.8%
Net income	538.5	793.4	1010.6	1782.1	-507.7	-118.7	496.1	871.2	1133.2	1229.0	1665.7	1345.6	1088.1	1900.0
# of Employees worldwide	6,400	9,700	17,700	24,100	20,100	17,400	20,000	22,700	26,500	31,100	37,700	42,100	43,200	48,500

Service initiatives

EMC Professional Services (est. 1997): EMC PS launch → Technology Solutions (rename) → Implementation & Integration (rename)

Information Solutions Consulting (est. 2002): ISC launch with Accenture → EMC Consulting (rebrand and begin to internalize)

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Appendix

Table A1. EMC Business Model Change Process

Period	Context	Formulation	Public Announcement	Routinization Process	Milestone or Turning Point
Founding & growth (1979-1994)	Startup. Begin as computer memory board vendor for Prime Computer platform. Add similar products for DEC, HP, IBM, and Wang platforms.	Establish routines within Sales and Customer Service organizations. No business model change as new products launched. Basic structure persists. Capacity added as needed.			Response to faulty supplier part in product nearly bankrupts firm in 1989. Customer service commitment imprinted during this crisis.
	Launch Symmetrix disk array storage product for IBM mainframe platform in late 1990. Symmetrix becomes the firm's flagship product with 3-year first mover advantage over rivals. Began exploring disk array products for low-end open systems platforms such as Unix and Microsoft Windows NT.	No change. Basic structure persists. Capacity added as needed.			Symmetrix as a modular, plug-compatible product is vulnerable as competitors begin to enter disk array market in 1994. First mover advantage expected to erode.
Enterprise Storage (1995-2001)	Seek to differentiate by productizing Symmetrix software capabilities beginning with SRDF. Surpasses IBM as mainframe storage leader. Triggers: learn that distributed environments will weaken the business model. Expanded service requirements will stress the "free" service approach. Due to modularity and plug-compatibility of disk arrays, head-to-head product competition will commoditize the category.	Professional Services as a complement to the BM. Interdependent with existing BM Organize - internal Startup investment - small Pace of routinization - slow (time to determine fit with EMC culture) VCF position - Fee service (hybrid relative to the base BM) Pilot test and tune	Press release - February 1998 Endorsers - CEO, Managing Director, and customer	Org stability - infrastructure in flux (structural changes, thin on resources, high managerial turnover) Effect on Customer Service routines - concern over new people creating support headaches; otherwise, adapting. Effect on Sales routines - aggressive resistance; cognitive dissonance; perceived as a substitute; slows down the sales process putting sales goals at risk; nickname "sales prevention"; incentives processed as short-run quarterly targets and not long-run threats. Limited acceptance - slow bottom-up process of recognition; hybrid offering confusion finds many reverting back to comfort of "free" Customer Service VCF positioning; some reject Professional Services and use familiar Customer Service personnel as workaround.	Exogenous shock: 2001. Competitor disk arrays begin to surpass Symmetrix hardware capabilities. Dot-com economic downturn changed everything. Professional Services was approximately 300 in 1999 and 600 in 2000.

Period	Context	Formulation	Public Announcement	Routinization Process	Milestone or Turning Point
Post dot-com recovery (2002-	Restructure so that software becomes an independent business out from under the Symmetrix engineering group. Begin to refresh the Symmetrix internal architecture. Take the low-end CLARiiON disk array more seriously. Overhaul of the business model.	Information Solutions Consulting as a complement to the BM. Independent of existing BM Organize - external (Accenture) Startup investment - small (add storage experts to ISC) Pace of routinization - quick VCF position - Fee service (distinctly different than Customer Service) No pilot test or trial	Press release - June 2002 Endorsers - EMC Global Services Senior Vice President, Accenture Group CEO, and an industry analyst	Org stability - infrastructure stabilized through outsourcing to Accenture Affect on Customer Service routines - N/A Affect on Sales routines - N/A Limited acceptance - while stable infrastructure and adequate predictability, low demand indicates low recognizability; not hitting desired revenue targets	Not hitting aspirational targets and nimble boutique storage consultants carving out territory. Begin rebranding and internalizing consulting in 2005.
	Not hitting aspirational targets and nimble boutique storage consultants carving out territory. Begin rebranding and internalizing consulting in 2005.	EMC Consulting as a complement Ambiguity on whether this should be independent or interdependent with product business Organize - internal Repurpose investment - modest Pace of routinization - modest VCF position - Fee service (debates on independent vs. interdependent) No pilot test or trial	N/A	Org stability - stable management but growing resource base via small acquisitions Affect on Customer Service routines - N/A Affect on Sales routines - inertia due to confusion of fee services; low awareness means lack of recognizability Acceptance - slow but gaining momentum as awareness grows among Sales	More BM options including ability to have service-led engagements. Flexibility leads also to co-opetition which is confusing to some.
	IT staffing shortages in the industry means demand for Professional Services is increasing. Redefine the scope of professional services as EMC-specific product solution implementations. Abandon attempt to create consulting organization.	Professional Services continue as a complement Interdependent with base BM Organize - internal; fix scope and implementation handoff issues (includes support engineers who are trusted by Sales) VCF position - continue as fee	Indirect mention of 1400-strong professional services organization included in 2002 ISC announcement. Planting seed of recognizability in scale.	Stability - yes Predictability - yes Recognizability - improved with the addition of systems engineers who were known and trusted by Sales. Acceptance - given much broader product portfolio and many solution configurations, complexity fuels need for implementation services.	

Figure A1. Services search terms

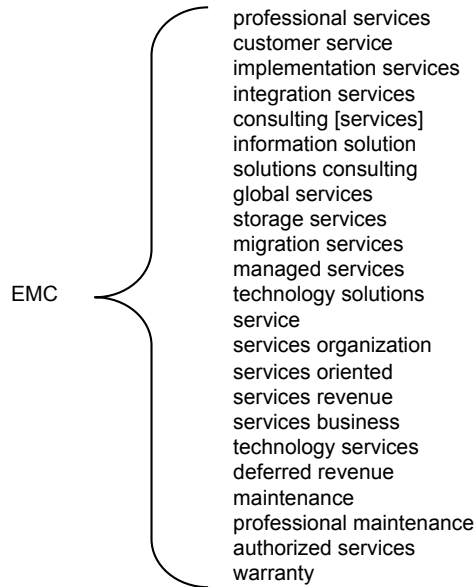**Search terms for EMC services events and information in analyst reports and Lexis Nexis news database**

EMC {
- professional services
- customer service
- implementation services
- integration services
- consulting [services]
- information solution
- solutions consulting
- global services
- storage services
- migration services
- managed services
- technology solutions
- service
- services organization
- services oriented
- services revenue
- services business
- technology services
- deferred revenue
- maintenance
- professional maintenance
- authorized services
- warranty

Figure A2. Overview of EMC major products and services

1979-1994

Memory circuit boards
- Prime (1981) ⟹ X
- + DEC, HP, Unisys, IBM

Disk array storage
- Symmetrix (1990)
  ➤ IBM Mainframe

- Harmonix (1992)
  ➤ IBM AS/400 ⟹ X

1995-2001

- Symmetrix
  ➤ IBM Mainframe
  ➤ Open systems

Networked storage connectivity
- NAS (1995)
- SAN (1999)

Symmetrix software products
- Symmetrix specific s/w
  ➤ SRDF, SMTF
  ➤ TimeFinder, PowerPath

2002-

- CLARiiON (1999)
  ➤ acquired
  ➤ Smaller capacity

Platform agnostic software
- Software acquisitions
  ➤ Legato, VMware
  ➤ Security, Cloud, …

Services
- Customer Service (1981)
- Simple install; "free"

Professional Services
(1997/1998)
- Symmetrix solutions
- "Charge for it"

PS repositioned
- EMC-specific implementation

- **+ Consulting**
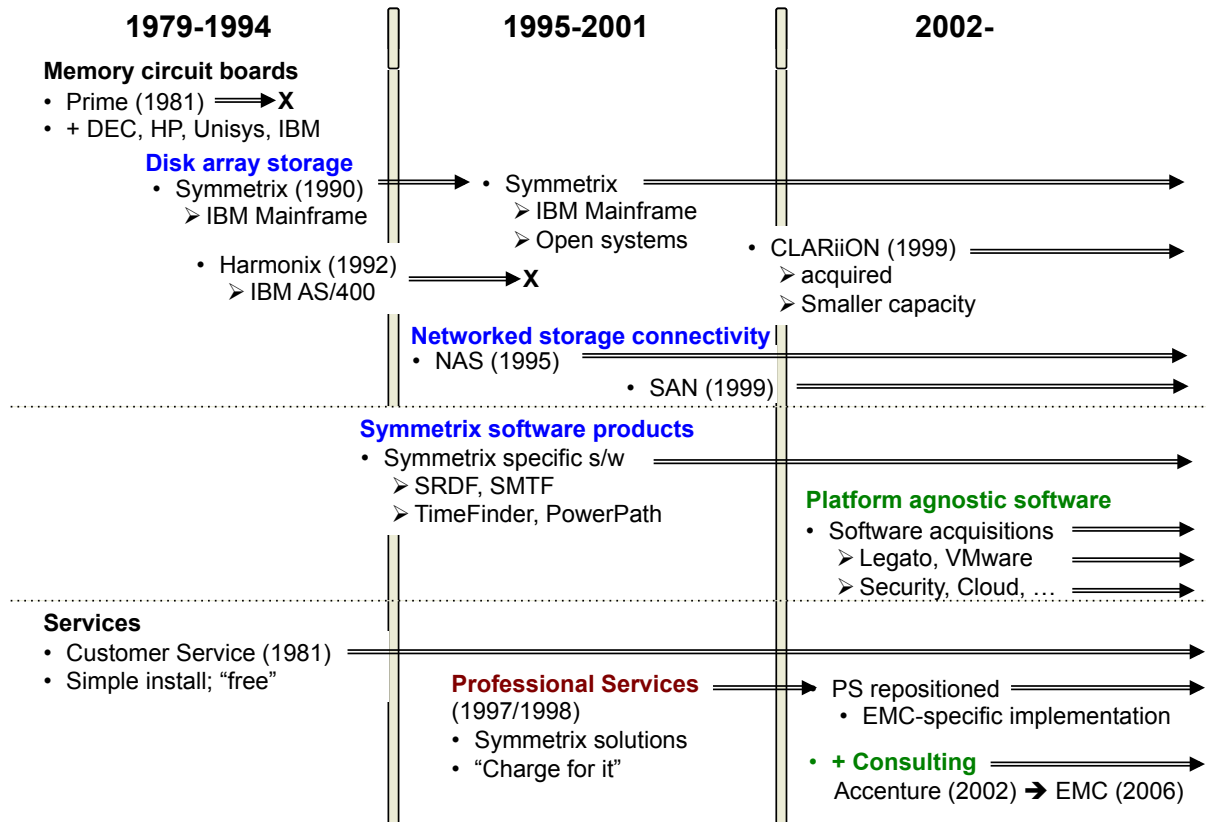 Accenture (2002) ➔ EMC (2006)

Table A2. List of interviewees providing perspective on EMC professional services

Informant Title	Date	Interview	Tenure	Other background information
Analyst, Global Services	Mar 31, 2009	In person	1999-	Mechanical engineering experience; former principal consultant at PwC
Director, Global Services	Mar 31, 2009	In person	2008-	Business analytics experience in financial services industry
Analyst, Global Services	Mar 31, 2009	In person	2006-	Former engagement manager at a management consulting firm
Senior VP, Global Services	May 11, 2009	In person	2005-	Management consulting experience
Former Director, Professional Services	Jun 14, 2010	In person	1997-2000	Prior software and services company experience
Former VP, EMC	Jun 18, 2010	Phone	1995-2001	DEC Consulting; former partner at management consulting firm
Former Planning Manager, Professional Services	Jun 25, 2010	In person	1996-2000	Former manager within DEC Consulting
VP, EMC Consulting	Jul 16, 2010	Phone	2008-	Founding member of Information Solutions Consulting while at Accenture
VP, Global Services, Americas Region	Jul 19, 2010	In person	1999-	Systems engineering experience at IBM
VP, EMC Consulting	Jul 23, 2010	In person	2004-	Engagement manager for EMC account while at McKinsey
VP, Global Presales Organization	Jul 27, 2010	In person	2000-	Systems engineering; services sales
Area Sales Manager, EMC	Oct 2, 2010	In person	1987-1989, 1990-	Mechanical engineering background; over 20 years in Sales at EMC
Former Regional Manager, Professional Services	Oct 6, 2010	In person	1997-2007	Within EMC Professional Services until 2001
VP, Symmetrix Business and Operations	May 1, 2011	In person	2002-	Senior Director, Windows Server at Microsoft

Table A3

EMC Sales organizational routines

Source	Representative evidence
Selection of candidates	
Sales manager	"I had a couple of years of work experience and they tried to use that against me as a way of testing me in the interview process. [They would say,] 'You're too old at 25.'"
Oral History with Mike Ruettgers, 5/2/2001	"The good news with the sales staff was that most were college kids. So it's like, bring them in, put them through boot camp, and tell them to go off and sell."
Aggressive and competitive	
Salomon Brothers report, 8/17/95	"The sales organization of EMC is very aggressive, and although we have found this is perceived as good by many users, some users viewed this aggressiveness as negative, noting that EMC has been known to disparage competitors and their products."
Sales manager	"Very aggressive. Very competitive. Those are probably the two best terms [to describe the sales culture back then]."
ComputerWorld, 5/22/1995	"After jumping into the mainframe storage market five years ago, the company cultivated a hard-charging marketing and sales style that has effectively wrenched customers out of IBM's embrace. But some mainframe shops are turned off by EMC's hyperaggressive approach... The company is not quick to admit defeat on sales. It has been known to go so far as to make end runs around reluctant IS managers to get the attention of their bosses, according to industry sources... Michael Ruettgers, EMC's president and CEO, acknowledged.. 'I want us to be liked by everyone," Ruettgers said. "But when you're trying to take business from IBM and customers have a long relationship of buying from them, you often have to push pretty hard. And you can't always take no for an answer.'"
Wells Fargo report, 2/1/01	"EMC comes equipped with what we believe is the most aggressive sales force in all of information technology… However, it takes more than aggression and a handsome compensation plan to make a strong sales force -- this is an idea that has been clear to EMC from the start."
CEO Joe Tucci interview, VARBusiness, 5/13/2002	"I think our sales force is incredibly aggressive and an envy of the industry. A lot of other CEOs have said they wished they had a sales force as aggressive and focused as ours. So we are still looking for the person who is willing to take a challenge. High-risk, high-reward type of mentality. If I don't sell, I'm not going to make very much. If I sell a lot, I can make quite a bit."
Sales training	
Sales manager	"Back then it was very basic sales 101 [training], which was one of the things that attracted me to it. It was a very formal 90-day program broken up into modules. It was a very straightforward process. This attracted me. I wanted some good sales training."
Sales manager	"One day out of the week would be basic sales 101 training, i.e., audio tapes you could go buy at Barnes and Noble. What that ingrained in you was that sales was ultimately a numbers game. You need to be smart. You need to be organized. You need to understand your competition and your products, but ultimately you need the energy and drive to continue to be able to take 'No' for an answer and move on [but then later] circle back to the customer."
Norms and expectations	
Sales manager	"[It was] very strict in terms of how you operated everyday. In the office by 7AM. You did your internal type work between 7-8AM. From 8AM-5PM, [you did] nothing but customer facing. [At] 5, 6, 7, 8PM – you did whatever you needed to do to be responsible for your customers."
Regional manager	"But there was also that image, it's EMC. At that time, I remember wearing a white shirt and a tie to work everyday. Blue suit, white shirt and a tie. Like the old IBM."

Sales manager	"The immersion into the field was immediate. You had a manager who was both your mentor and your manager. He gave you a chunk of physical territory and the world was your oyster."
Sales manager	"Yes, [I would cold call] as high [ranking] as possible. That was part of the basic training. We had an elevator pitch that we worked extensively so that when you got that person on the phone you had something to say. You had your hook. You asked for your meeting. If deferred, at least try to send something in the mail… and then you do a followup. You'd be surprised. I got many meetings where it took me 12-18 months to get through perseverance... You were expected to know everything there was to know about your product and the competition."
Oral History with Mike Ruettgers, 5/2/2001	"One of the things I've learned is typically sales guys are the first line of defense of poor quality. The good ones will refuse to sell a product to a customer if they know the product doesn't work."

Compensation plan

Director	"These sales guys were making big, big, big, big money – seven figures."
Regional manager	"EMC was printing money. You had 23-24 year old kids still wet behind the ears making a million dollars a year."
Sales manager	"Printing money. We really were. And they incentivized us heavily."
Sales manager	"['Club'] was strictly an achievement club. It was Club 101. If you made 101% of your annual quota, then you went on this all expenses paid 3-day trip. The top 10% of people who made Club were considered Platinum Club, which meant an extra day and upgraded accommodations or something like that. That was the motivation... It was primarily about making money. It varied over the years but the incentives were always there especially in the 90's and into early 2000."
Computer Reseller News, 11/12/2001	"Ruettgers put in place a compensation structure for the Keane sales force that let top performers earn more than $100,000, a hefty paycheck for a top salesperson in the early '80s. This thinking would later color the sales force incentives he instituted at EMC, making many EMC salespeople millionaires."

Sales employee management process

Sales manager	"They would get the whole global salesforce together every 90 days; and we weren't that big. They would rank everybody and put it up so all could see. So you knew exactly where you stood because we all had the same quota regardless of your territory which was set from on high. Back then was kind of the wild west in terms of opportunities…"
Regional manager	"[In] the field office, part of the culture then was to fire at least 5% of your staff on a quarterly basis -- the bottom 5%. So stack ranking was a term I became very familiar with -- every quarter. Some quarters it was 10% and some quarters it was only one or two people. ... This came out of Jack Welch [former CEO of General Electric] who was always a proponent of stack ranking your people and getting rid of the bottom 5% and bringing in the performers... You look around and say I have 15 guys and they all did 125% or higher of quota. Why would I fire anybody? 'Yeah but [somebody else] had some people that did 250% of quota. So they did twice as much as these guys. These guys aren't performing.' Those are the conversations that would go on... It's just that constant give and take, that tension that was always there. People had made 125% of quota, kicking ass on their [compensation] plan, and could still get let go."

Commitment to Symmetrix

Sales manager	"Symmetrix was the answer to any problem you had."
Sales manager	"Centriplex was our attempt at the midrange but we didn't do it well. We weren't really focused on it. And it was tough… The way I viewed it and the way I think most [sales] people viewed it was you're better off fighting for Symmetrix… We had our issues over the years but generally speaking, it was such a solid platform that if I could get you to pay the premium, it made my life a lot easier. It rarely had issues and if it did, we were all over it. We had the support in place. We understood the environment. It all made sense. So if you're going to bang your head off the wall selling something, do you want to sell a Toyota or a Dodge? I think you're going to sleep better if you own a Toyota."

Power

Director	"The egos were pretty big there. Because you came from IBM, that wasn't highly regarded. Because you came from HP, that wasn't highly regarded... The guys who really wielded the power there were the guys who grew up there. The guys who came in as recent college grads and got taught a way to sell and taught a way to behave and taught a way to manage sales people... When I was there that's what ruled the roost big time…big time."
Senior VP	"The other dominant culture is the sales culture, which at EMC is the dominant culture. The sales organization owns the customer. They are responsible for the account relationship. We have very 'Type A' people within sales who want to own the agenda with the customer."

Table A4

EMC Customer Service organizational routines

Source	Representative evidence
Customer service was "free"	
Director	"Prior to this new [professional services] organization, everything EMC did for services was bundled in. They had a huge Customer Service organization. It was highly regarded internally and externally. Internally, 'it's free.' It doesn't cost Sales anything to bring these guys in. And it makes the Sales guy look good because [Customer Service] makes the customer look good. The Customer Service organization was predominately hardware install and break/fix [support]."
Vice President	"At EMC, Customer Service was free. When you bought something, it was 'premium priced' into the price of the product. There was no separate invoice for Customer Service. And sales support was free as well."
Director	"Services were a cost center, not a profit center. When customers bought a Symmetrix, it came with remedial maintenance for three years. The goal was every three years, it was upgraded and traded in so [we] didn't need to worry about selling services. For those customers who wanted to keep their Sym, there were service contracts available that the service people would sell if the customer wanted it. But the goal was never really to sell services as a revenue stream for the company. [It] just wasn't thought of that way."
Madison Securities analyst report, 12/20/99	"EMC differentiates itself from its competitors with distinctive customer service. While EMC charges higher prices for its products, customer service is free. EMC's reputation as being fanatical about keeping customers happy is legendary in their industry. EMC's attention to servicing its customers is an effective barrier to competition."
Problem solving culture	
Analyst	"Specific to EMC, we have always been on the [maintenance] services side more of an investment center. It was more the strategy, from a business standpoint, primarily to have customer satisfaction and technical support that was beyond reproach and would be part of the brand."
Computerworld, 6/15/92	"EMC's technical support is as good as IBM's, the users said. The vendor regularly checks in to clear up trouble before it impacts operations. Symmetrix mirroring and hot replacement allow EMC technicians to fix problems without downtime, where IBM technology still requires some downtime for replacement."
Madison Securities analyst report, 12/20/99	"EMC differentiates itself from its competitors with distinctive customer service. While EMC charges higher prices for its products, customer service is free. EMC's reputation as being fanatical about keeping customers happy is legendary in their industry."
Fast Company, June 2001	"But it is impossible to understand EMC's 10-year rise without appreciating its commitment to customer service. The company boasts that its customer-retention rate is an astonishing 99%. When Forrester Research surveyed 50 big companies about their various technology suppliers, 'EMC came out looking like God,' says Carl Howe, a director of research at Forrester. 'It had the best customer-service reviews we have ever seen, in any industry.'"
Fast Company, June 2001	"'What [the 1988 product quality crisis] proved to me, to all of us, was that when a customer believes in you, and you go to great lengths to preserve that relationship, they'll stick with you almost no matter what,' says Ruettgers, who is now 58. 'It opened our eyes to the power of customer service.'"

Remote support technology

Analyst	"So there's a distributed, around the clock, remote support capability [where] most of the systems we sell have this remote connectivity capability where they report back problems. We used to call it Dial Home... [It helps in] identifying a problem and dispatching somebody and resolving it remotely."
EMC press release, September 1990	"The system also offers key hardware redundancy and is equipped with an 'auto call' capability, which automatically notifies an EMC service center of a system problem or future system need, such as a replacement part."
Salomon Smith Barney, 7/7/1999	"EMC has four system support centers worldwide that provide 24-hour/seven-day/ 52-week coverage. Each storage subsystem has a "phone home" capability that alerts the EMC support system staff to potential or actual system problems. These technicians have access to the system developers and both are responsible for bringing the problem to closure."
Fast Company, June 2001	'Most of the time, we address problems before the customer even knows that there's an issue,' says Walton. Sensors that are built into EMC's storage systems monitor things such as temperature, vibration, and tiny fluctuations in power, as well as unusual patterns in the way data is being stored and retrieved... Every two hours, an EMC system checks its own state of health. If the machine spots something it doesn't like, it 'phones home' to customer service..."