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Information Technology Implications in Corporate Mergers, Acquisitions, and Demergers

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Abstract

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By Astrid Fontaine

Mergers, acquisition, and demergers are common elements of corporate restructuring and renewal. During this dynamic process, companies alter themselves by realigning resources. Corporate change requires changes in information technology (IT), like the set-up of new IT operating environments. Prior research has investigated IT integration following mergers or acquisitions. Little is known about the process of IT dis-integration in the context of corporate demergers. This initial study develops a process model of IT dis-integration centered on a representative in-depth case study, identifying three phases and the impediments that threaten successful outcomes. The initiation phase involves secrecy and limited experience; the closing phase involves time pressure, tension, and fear among employees; and the transition phase involves lack of urgency, loss of knowledge, and unforeseen uncertainties.

Corporate restructuring and renewal depend on access to external competitive resources, which commonly motivate mergers and acquisitions. This is especially true in the IT industry, where speed of innovation leads to rapid knowledge depreciation and successful acquisition of external knowledge is important. Knowledge within acquired firms can be codified and easily transferred; however, competitive advantage often lies in individual-level knowledge residing within employees from the acquired firms. Academic research has identified the importance of retaining these employees;

nevertheless, it remains unclear what level of retention is associated with technology acquisition success. This study applies a computational simulation to identify the steepest increase in acquiring firms' knowledge within the first forty percent of retained employees from acquired firms, suggesting a decrease in marginal utility.

Retention level is, however, not only a decision for the acquiring firm. Employees can choose whether to stay or seek employment elsewhere. This study attempts to understand if and why employees from acquired firms stay after technology acquisitions. Analysis of archival data indicates that less than twenty-five percent of patent inventors from acquired firms remain with the acquiring firm. Using job embeddedness as a theoretical framework identifies that inventors are more likely to stay when the acquired and acquiring firms are similar in regard to ownership structure. However, hypothesized success due to prior relationships between firms and geographical proximity is not supported.

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Overview

Mergers and acquisitions are considered important strategic options in corporate redirection and renewal (Jemison and Sitkin 1986). Not surprisingly, global investment in mergers and acquisitions has continued to reach unprecedented levels in recent years (Barkema and Schijven 2008). In 2010, the global merger and acquisition volume was $2.74 trillion worldwide, followed by a similar volume of $2.7 trillion for firms acquiring worldwide in 2011 (Times 2011).

Paralleling their corporate importance, mergers and acquisitions have become the focus of research in multiple academic disciplines (Haleblian et al. 2009). Early research in the field of finance was concerned with whether mergers and acquisitions added value to firms. The majority of academic studies suggested that mergers and acquisitions did not enhance the financial performance of acquiring firms, neither short-term nor long-term (i.e., Jarrell and Poulsen 1989; Agrawal, Jaffe, and Mandelker 1992).

More recent academic research in the field of finance and strategic management aims to understand why acquisitions often under-perform and questions antecedents of acquisition success as well as potential moderators of acquisition performance (Haleblian et al. 2009). The recent growth in merger and acquisition volume has drawn attention to the complex phenomena of mergers and acquisitions and has drawn broader academic attention. Beyond finance and strategy, many behavioral, operational, and cross-cultural aspects are considered as challenges to merger and acquisition performance (Cartwright and Schoenberg 2006).

Despite all the theoretical insights, study after study still places the failure rate of mergers and acquisitions somewhere between 70% to 90% (Christensen et al. 2011). Mergers and acquisitions are far more complex as the process consists of many interdependent activities, each customized to the specific deal at hand (Barkema and Schijven 2008). Given the failure rates in mergers and acquisitions, it is not surprising that prior research identified that approximately 40% of acquired companies were later separated and sold off (Tetenbaum 1999; Kaplan and Weisbach 1992). Consequently, as Peter F. Drucker (1999, 1) stated "… there is no merger boom today. There is a merger and demerger boom."

However, that aspect of corporate renewal, the demerger or divestiture (hereafter referred to simply as *demerger*), has gone relatively unnoticed or is being silently assumed to be simply a part of mergers and acquisitions. Capron et al. (2001) identify that demergers are often part of the reconfiguration of merging firms. Demergers are more than just a merger in reverse. They have become an accepted corporate strategy to re-focus companies and manage their level of diversification (Cristo and Falk 2006). Corporate demergers are becoming almost as important as mergers and acquisitions (Shinghvi 1984).

Given the strategic importance and occurrence rate of demergers, academic research is surprisingly limited with regard to demergers. Similar to the merger and acquisition literature, considerations of demerger first started in the academic field of finance. Finance literature provides mixed results with regard to financial performance of firm demerger. Kaplan et al. (1992) identified that up to 50% of demergers were unsuccessful. Other studies found demergers increased shareholder value (Mulherin and Boone 2000; Boot 1992).

Demerger research has also extended into the field of management research in recent years. Related studies explore the antecedents of demergers, identifying over-diversification and poor corporate strategy (Hoskisson, Johnson, and Moesel 1994) as major factors that motivate demerger decisions. This supports prior findings, indicating that only one third of all demergers are directly related to unsuccessful mergers and acquisitions (Kaplan and Weisbach 1992).

Mergers and acquisitions as well as demergers represent major restructuring of corporate processes as well as recombining of corporate resources (Capron, Mitchell, and Swaminathan 2001, 817). As these corporate strategies require the integration or dis-integration of corporate assets, including financial, physical, and human capital as well as business processes, they also depend on integration and dis-integration of information technology. Given the tight interlink between business processes and supporting information technology, any organizational integration in the case of mergers and acquisitions, or dis-integration in case of demerger cannot be effectuated without successfully integrating or respectively dis-integrating the information technology resources of hardware, systems, and people (Bharadwaj 2000). Prior academic work in this field has focused almost exclusively on post-merger integration of information technology.

Post-merger information technology (IT) integration following mergers and acquisition usually begins with the creation of linkage between two previously separated

IT environments. Managing post-merger IT integration involves an understanding of the dynamic relationship between IT and business activities as well as between IT and the merger intent. Influences on both relationships must be considered when deciding and implementing a post-merger IT integration strategy. A limited body of literature exists that treats different aspects of the management of post-merger IT integration and observed integration solutions. This scholarship identifies IT integration as a key antecedent to merger and acquisition success (McKiernan and Merali 1995), and it illuminates factors that influence the success level of IT integration (Johnston and Yetton 1996; Brown, Clancy, and Scholer 2003).

A number of studies have presented various models for post-merger IT integration strategy. Giacomazzi et al. (1997) develop a conceptual model for post-merger IT integration that describes criteria for choosing different integration strategies. Wijnhoven et al. (2006) conceptualize an alignment model between merger objectives and post-merger IT integration objectives. Metha and Hirschheim (2004, 2007) offer a conceptual framework to understand how and why certain post-merger IT integration decisions are made. In addition prior academic work has explored success factors related to post-merger IT integration, identifying that IT participation in the pre-merger phase, the quality of merger planning, the criteria used for setting the IT integration strategy, and a high level of integration amongst existing applications prior to a merger have a positive influence on the success of post-merger IT integration (Alaranta 2005; Stylianou, Jeffries, and Robbins 1996). Overall the field of post-merger IT integration is still in an exploratory phase, as most research relies on case studies.

The state of academic research with regard to considerations of information technology's role in demergers is even more sparse. The main body of publications mentioning information technology in the context of demergers is basically practitioner related; however, those articles emphasize the importance and challenges of IT dis-integration (i.e., Denton and De Cock 1997; Mankins, Harding, and Weddingen 2008). Academic work related to IT dis-integration in the context of demergers is generally limited to brief descriptive conference papers, indicating the exploratory state of this research stream within the wider context of corporate restructuring and renewal.

One group of academic researchers explores the basic structures of IT dis-integration operations and success factors and also offers the first considerations of a process of IT separation activities (Leimeister et al. 2008; Faehling et al. 2009). These studies identify that, given the severe time pressure in demergers, companies rely on a phased approach of systems dis-integration: first a separation of data (logical separation) followed by a separation of the specific systems themselves (physical separation). Another study considers IT related challenges that companies face in demergers as well as antecedents of those challenges (Boehm et al. 2010). Researchers have also investigated the impact of IT dis-integration on regulatory compliances for demerging companies. Tanriverdi and Du's (2009) paper identifies that corporations with higher demerger intensity are more likely to become non-compliant with Sarbanes-Oxley-Act due to the level of on-going change in the IT environment. A follow-up study by the same researchers identifies that transitional service agreements that allow the parent company to provide IT services to the carve out following the closing of a demerger can have performance impacts on the carve out company (Du and Tanriverdi 2010).

Considering the corporate importance of demergers in the context of strategic renewal and reconfiguration of contemporary organizations, the importance of gaining insights into the management of demergers cannot be underestimated. One of the issues to be dealt with in this context is the question of how demerging companies are to be separated, which also asks us to consider the dis-integration of information technology. Indeed, the dis-integration of information technology has been cited as one of the leading challenges during the process of demerging corporations. Because information technology dis-integration in the context of corporate demergers has rarely been studied, our understanding of how the process of separating information technology resources unfolds, and what impediments there are to the successful completion of dis-integration, is embryonic. These gaps are also of considerable practical significance because they pertain to how and why managers need to consider the information technology aspect in demergers. The objective of the first essay of this dissertation is to address these gaps by identifying how the process of information technology dis-integration unfolds over time and what impediments the various phases of separation process face.

Returning to the central theme that mergers and acquisitions, as well as demergers, are all "elements of a dynamic process in which firms change their business by recombining" their resources (Capron, Mitchell, and Swaminathan 2001, 817), this dissertation also aims to consider the aspect of resource recombination. Specifically in the IT industry, firms are required to innovate continuously to maintain or increase their competitiveness. However, the speed of innovation and change in the IT industry can create situations where firms do not possess the critical knowledge resources necessary to create new products (Graebner, Eisenhardt, and Roundy 2010).

Firms may choose to acquire external resources that are of strategic importance to them. The desire to obtain valuable resources such as technological knowledge increasingly drives the merger and acquisition wave (Bower 2001). Success of technology acquisitions, acquisitions that aim to obtain external technological knowledge, is contingent upon the ability of acquiring firms to manage acquisitions in order to exploit the capabilities and technologies of the acquired firms in a coordinated way and foster the exploration capacity of the acquired firms by preserving their autonomy (Puranam, Singh, and Zollo 2006).

Thus acquiring firms aspire to integrate acquired technology-based firms in a way that retains their creativity, practices, and technical knowledge and ensures a high level of contribution to the acquiring firm. Effective post-merger integration is crucial to the successful transfer and utilization of externally acquired knowledge. This post-merger integration might pose a dilemma as Puranam et al. (2006) point out; the acquirer has to integrate the acquired firm in order to commercialize the acquired technology and, at the same time, strive to maintain some degree of autonomy in the acquired firm to avoid destruction of its innovation capabilities. Graebner (2004) identifies effective implementation and integration as essential for a successful acquisition, emphasizing the integration versus autonomy dilemma as critical in technology acquisitions. Ranft and Lord (2002) propose that integration might lead to destruction of the acquired firm's knowledge base due to employee turnover and disruption of organizational routines. In addition, they suggest that the acquirer might be unaware of where valuable knowledge resides within the acquired firm and thus risks the loss of key employees or mission critical organizational know-how during a fast integration. Walter et al. (2007) find evidence in the biotechnology industry that acquisition of scientific and technical knowledge often fails because acquirers are unable to transfer and apply the knowledge.

Maintaining the acquired firm's knowledge and successfully transferring it to the acquirer is a major challenge for the success of mergers and acquisition (Felin and Hesterly 2007; Kozin and Young 1994). In the context of technology acquisitions, scholars have considered two major categories of knowledge: codified and un-codified knowledge (Graebner 2004). Un-codified or individual-level knowledge resides within the individuals of an organization (Miller, Zhao, and Calantone 2006). Thus, ensuring a high retention rate of these critical individuals becomes crucial for retaining knowledge (Donahue 2001). Typically, the transfer of individual-level knowledge begins with the retention of individuals from the acquired firm and continues with the incorporation of their knowledge into the acquiring firm's process of organizational learning.

While there has been extensive study of the antecedents to technology acquisition performance, there has been little consideration of retention strategy and its impact on the overall knowledge of the acquiring firm. As various levels of retention strategy cannot be observed within one specific acquisition, but require a range of technology acquisitions, various factors affect the empirical study of the knowledge levels of acquiring firms, hindering a detailed analysis of the relation between retention level and knowledge level. However, in an attempt to shed some light on the question of the relationship between retention strategy for employees from the acquired firm and its impact on the knowledge level of the acquiring firm, the second essay of this dissertation employs a computational simulation. The conducted simulation allows the observation and analysis of various levels of retention with regard to employees from the acquired firm and their direct impact on the knowledge level of the acquiring firm.

In addition to the general consideration of employee retention from acquired firms and performance of technology acquisitions, more recent academic work has started to explore the aspect of specific knowledge workers: the innovators from the acquired firm. Prior academic work has investigated the innovative performance of innovators from acquired firms post-acquisition. Related studies indicate a drop in the innovative productivity of inventors from acquired firms following an acquisition in comparison to a control group of patent inventors whose companies were not acquired (Kapoor and Lim 2007; Paruchuri, Nerkar, and Hambrick 2006). In addition to the respective drop in performance comes the evidence that mergers and acquisitions increase the voluntary turnover rate of employees from acquired firms (Cartwright and Cooper 1990). Increased voluntary turnover during mergers and acquisitions can lead to a loss of knowledge workers, who carry the exact knowledge that motivated the technology acquisition in the first place (Kane and Alavi 2007).

However, prior research fails to deepen our understanding of the reasons why some employees from acquired firms, in specific knowledge workers like innovators, chose to stay with the acquiring firm while others leave. In order to increase our understanding of why some technology acquisitions are more successful than others, the third essay of this dissertation addresses this gap and investigates factors that impact innovators' decisions to stay with acquiring firm following a technology acquisition.

Mergers, acquisitions, and demergers, have an impact on information technology on various levels. They present a context that requires a more integrated approach between the fields of organization studies and information technology. Following the call from Orlikowski and Barley (2001) to develop more research that considers the social and information technology aspects of organizations and that allows us to bridge the knowledge of information technology and social processes, this dissertation aims to provide a better understanding of techno-social phenomena in the context of corporate renewal and restructuring.

The multi-disciplinary nature of information technology and mergers, acquisitions, and demerger provides a vast research area difficult to be cohesively understood in one study; however, piece-by-piece academic research aims to unravel and understand these complex corporate phenomena. The current study aims to add some pieces to the puzzle and support the continuous research stream by identifying the implications of corporate processes of renewal and restructuring as well as information technology.

Corporate Demerger: A Process Perspective on Information Technology Dis-integration

Introduction

Demergers are more than just a merger in reverse. They are considered part of an ongoing enterprise reconfiguration process and have become an accepted business strategy to re-focus corporations managing their diversification (Cristo and Falk 2006). As such, demergers have moved beyond being considered evidence of merger and acquisition failure and, instead, are important vehicles for corporate strategic redirection and renewal.

However, with the rise of enterprise solutions and shared services leading information technology integration and standardization strategies within contemporary corporations, companies have created tightly integrated businesses that are hard to carve out into standalone units (Deloitte 2012).

The dis-integration of information technology (IT) has become a major consideration in practical demerger strategies. ConocoPhillips, the world's sixth largest oil producer, decided first to explore and plan how to separate its tightly integrated IT environment before splitting the business into two separate legal entities (King 2011). Jim Mulva, the chief executive of ConocoPhillips, stated: "making sure we have the proper IT systems and everything else that you need in these companies" was a priority (King 2011, 1). Similarly, Ford set up a four-year project to dis-integrate Visteon's back-office business processes from its Ford IT systems. The IT dis-integration planning and implementation started over a year prior to the announcement that Ford was carving out Visteon as stand-alone entity. Alex Preston, Vice President at Visteon, states: “Cutting the umbilical cord to Ford is a gargantuan task. We have to replace every system” (McGee 1999, 1).

Other companies chose to dedicate years of IT related support in order to allow enough time for the entities to separate their complex IT environments without major disruptions for the business. In the case of Unilever selling their shared service centers, they signed a seven-year outsourcing agreement for the buyer to provide ongoing financial system support to minimize disruption to the operating business (Insights 2012).

Considering that approximately one in three mergers ends up in some type of demerger (Mankins, Harding, and Weddingen 2008) and the need to carefully unravel the complexity of an underlying IT environment in order to ensure effective dis-integration, demergers and their related need for IT separation have become a major challenge in corporations today. However, demerger research has not kept pace with the level of demerger activities. Scholars traditionally have considered demergers simply a form of mergers and acquisitions, if they provided any consideration for demergers at all.

Prior research related to demergers had two emphases: a narrow focus on the financial perspectives of demergers and an expanded focus that considers corporate strategic redirection and the need for renewal. Existing literature related to demergers provided a variety of motives for undertaking demergers, including the need to exit lower growth businesses or to allow subsidiaries better growth opportunities (Pearson 1998).

Prior research also identified a number of challenges in the process of demerger, like time pressure (Denton and De Cock 1997) and the complexity of the transaction (Gole 2009).

Issues of IT dis-integration have received considerably less attention. Most prior research on IT dis-integration has simply asserted the perspective that it is important to consider the need to separate information technology environments as well as the related risks (i.e., Leimeister et al. 2008; Boehm et al. 2010). Focusing on successful and unsuccessful practices, these perspectives are a source of interesting research. However, they can sometimes miss key issues that a process approach reveals. Such is the case in demerger-related IT dis-integration research where insights into understanding IT dis-integration outcomes may be discovered more readily by paying attention to the underlying process of effectively separating IT environments as well as related impediments. Process models focus on sequences of events and theorize how and why the process evolves in a certain way (Newman and Robey 1992).

The primary purpose of this paper is to add to the existing body of demerger research by considering a process perspective that recognizes the IT dis-integration process itself as a potentially important determinant of demerger outcomes. The present work questions how the process of IT dis-integration unfolds over time and what impediments the various phases of the separation process face. This work offers a series of research propositions suggesting how the IT dis-integration process and the impediments present in the process might affect demerger outcomes.

This study uses an in-depth case study of IT dis-integration during a recent corporate demerger in a United States based Financial Service Firm. The IT dis-integration was mission critical to the successful demerger of the company. The case study identifies a team of in-house IT experts experiencing the first phase of initiation as a three-month multilayered separation scenario for a tightly integrated IT environment. In order to complete the demerger and achieve legal independence for the two demerging entities, the IT team accomplished a partial physical and logical separation of its system landscape in the second phase of closing, which occurred within five months. During the final transition phase the team accomplished a complete physical separation of the entire IT environment in less than six months. In addition to the identification of timely sequences of events and the development of the IT dis-integration process, this paper also proposes seven key impediments in the phased IT dis-integration process: secrecy, lack of experience, tension and fear, time pressure, knowledge loss, lack of urgency, and unforeseen uncertainties.

In the sections that follow, existing literature on demerger and considerations of information technology in the context of a demerger as well as process theories are reviewed. The IT dis-integration process in the Financial Service Firm case is presented and organized around phases that were observed and incorporated into the model. Thereafter, the IT dis-integration process model is explained and discussed in light of existing literature. In order to make process-based predictions about demerger outcomes, research outside traditional demerger literature has been tapped to identify potential factors that focus on the process itself as an important variable. This paper concludes with a discussion of the implications of the model for both research and practice, limitations of the current study, and directions for future research.

Background: Demerger, IT Dis-integration, Process Theory

Demerger

Demerger, a term that subsumes various forms of breaking up enterprises (also termed spin-offs, sell-offs, or divestitures), shows a broad range of definition. This study refers to demerger as the complete separation of a joint enterprise into two or more independent legal entities that might operate individually as standalone companies or as parts of other enterprises in the future; a similar definition is used by Kirchmaier (2006) as well as Cascorbi (2003). Demergers have long represented a substantial fraction of merger and acquisition (M&A) activities; Tetenbaum (1999) identified that over 40% of M&A integrations are separated again. Especially, many of the mega deals of the 1990s have resulted in many of today's demergers (Frank 2002).

Causes for demerger are partly seen in a lack of M&A performance, as repeated studies show that about half of all mergers fail to generate shareholder value or live up to their promises (Frank 2002). Demergers allow enterprises to sharpen their portfolios and to keep only what is vital to the firm, or what generates value (Mankins, Harding, and Weddingen 2008); it is assumed that demergers make businesses more focused and stronger. Empirical studies find that the financial performance of parent companies often improves following a demerger (Cristo and Falk 2006). Pearson (1998) summarizes common rationales for demergers as (1) the need to exit from lower growth businesses in order to increase the long-term growth potential of a portfolio; (2) a belief that the market cannot accurately value the component businesses of the enterprise; (3) the recognition that the businesses being divested are worth more to others; (4) increasing competition in the core business that requires greater management focus; (5) an erosion of synergies between businesses, reducing the rational for keeping them together; and (6) the constraint on growth opportunities for subsidiaries. Given these causes, demergers have advanced from a sign of failure to a strategic management tool: “What is going on, in other words, is not a merger boom. It is massive restructuring” through merger and demerger (Drucker 1999, 2).

As demergers require the separation of corporate assets, including financial, physical, and human capital as well as business processes, they also depend on the separation of IT resources. Hardware, systems, and the IT workforce (Bharadwaj 2000) need to be dis-entangled. Understanding the separation of IT environments following a firm’s demerger decision addresses an important organizational problem during the temporal process of business separation. IT architecture, as well as business applications and systems that have been integrated in the past across the enterprise in order to deliver seamless and efficient IT operations, must now be pulled apart under demanding time and compliance constraints (Faehling et al. 2009; Gole and Hilger 2008).

Denton and De Cock’s (1997) case of 3M’s spin-off identifies extreme time and success pressure on demerger projects. The case also reflects that dis-integration of IT can create a major problem area for the demerger. In their specific case, there was not a complete break between the IT environments despite all possible efforts; some systems had to continue operating jointly (Denton and De Cock 1997). In a similar fashion, the work of Mankins et al. (2008) points out that cross-company systems need to be carefully unraveled or even shared by both companies during a transition period to ensure effective separation. The paper clearly states that legacy systems are frequently deeply embedded in the company, and the disentanglement of assets and ownership can be very cumbersome. In the case of Bell Canada's recent spin-off of its regional small-business operations, the sale of physical assets was easy enough; however, the IT networks that supported the entire enterprise could not be ripped out or re-created on short-term notice and required major monetary investment (Mankins, Harding, and Weddingen 2008). These prior studies support the need to consider that IT has become one of the most complex and difficult areas within the demerger process.

IT Dis-integration in Demergers

IT dis-integration caused by a firm's demerger decision refers to the process of disentangling previously integrated and unified IT resources and their allocation between the carve out and the parent company in order to create independent business operations (Tanriverdi and Du 2009). Leimeister et al. (2008) identify three main IT dis-integration strategies: (1) logical separation, the separation on the data level only; (2) physical separation, which allows the operation of applications on separate systems and technical environments; and (3) stepwise separation, where the logical separation is used as an interim solution followed by a full physical separation. Transitional service agreements (TSAs) are used to ensure the former parent company continues its operation and support of the carve out's IT environment until a full physical separation is completed. In those cases, the former parent organization acts during the transition phase as a kind of IT service provider to the carve out (Boehm et al. 2010). This arrangement sounds similar to any type of outsourcing agreement; however, the parent usually has a limited interest in serving as an IT service provider as that role hinders it from putting full attention on its own IT operations. In addition, neither party expects to repeat the IT service business.

Both parties usually seek to finish TSAs as soon as possible in order to focus on their own businesses and strategic development within their IT departments.

The challenge for IT is to keep operations running and ensure data consistency, availability, and security while dealing with the IT separation (Leimeister et al. 2008). Further challenges in demergers can occur within the trend of tightly integrated IT environments, which make demerging and the subsequent carve out of businesses more complex (Coury and Wilson 2009). Barki et al. (2005) identify the integration of IT systems and processes within and across a firm's boundaries as an important task, as IT integration enhances connectivity, communication, collaboration, and coordination within and across business boundaries and generates synergies and performance benefits. Similarly, Tanriverdi (2006) stated that enterprises pursue IT integration across their entire entity on a daily basis to ensure coordination and synergy amongst businesses. However, the dominant IT integration paradigm creates barriers for the separation of IT during times of demergers (Markus 2001). Tight integration results in huge efforts to disconnect business operations between the carve out and the parent company during demergers. Consequently, corporate restructuring activities like demergers nowadays require significantly more time and resources, especially on the IT side, to create standalone businesses. Not surprisingly, the process of IT dis-integration often represents the greatest cost position in demergers (Leimeister et al. 2008). However, academic research has barely considered these aspects of organizational change.

Similarly, the practitioner world reports evidence that IT is seldom involved in early demerger considerations or contract negotiations. The neglect of IT considerations in the planning of corporate demergers can lead to longer transitional IT services based on transitional service agreements and subsequently higher cost for demergers (Tanriverdi and Du 2009).

Considering those prior anecdotal insights and the importance of IT separation to the overall success of demergers, an in-depth understanding of the distinct actions and processes of IT dis-integration seems of great importance in order to explain variations in demerger outcomes and to inform practitioners more accurately about the management of demergers.

Process Theory

In his classic work on organization theory, Mohr (1982) defines process theories as those that provide explanations in terms of the sequences of events leading to an outcome. Most commonly, process theories are referred to as an explanation of how and why a social entity changes and develops (Van de Ven and Poole 1995). Subsequently, process models focus on sequences of events over time in order to explain how and why particular outcomes have been reached; sequences of events occur within the context of described antecedents (Newman and Robey 1992; Sabherwal and Robey 1995). Figure 1 provides a simplistic view of a process model.

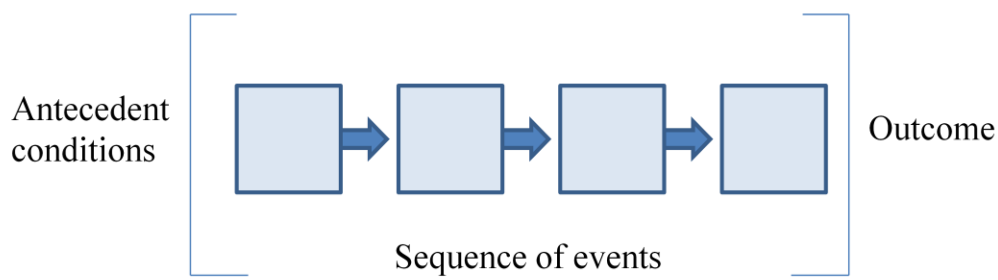


Figure 1: Process Model as in Newman and Robey (1992)

Van de Ven and Poole (1995) introduced four basic types of process theory that allow us to explain how and why change unfolds in social entities: (1) life-cycle, (2) teleological, (3) dialectical, and (4) evolutionary theories. The four types of process theory can be distinguished from each other by their different event sequences and the underlying logic of what drives the process.

The life-cycle process model follows a single sequence of phases in which characteristics are acquired and retained (Van de Ven and Poole 1995). The phases are related in the sense that they derive from a common underlying process. The progression is based on the prefigured final end state, and, in order to reach the outcome, a specific sequence of events is required. Consequently, each event contributes a portion to the final end state. Life cycle process models, such as Maehring and Keil's (2008) model of information technology project escalation, have been used to explain programs that require developmental activities to progress in a prescribed sequence.

The teleological process model assumes that an organizational entity proceeds towards a goal, and, as such, the organizational entity is considered purposeful and adaptive (Van de Ven and Poole 1995). In a teleological type process model, the organizational entity defines a goal and takes action to reach it while monitoring its progress. However, unlike the life-cycle model, this process model does not assume a pre-defined set of sequences of events or phases. The focus in the teleological process model is on the accomplishments that have to be achieved in order to reach the pre-defined goal.

The dialectical process model requires two or more organizational entities that embody oppositions that confront each other in conflict (Van de Ven and Poole 1995). In this process, stability and change are explained as a balance of power between two or more organizational entities.

The evolutionary process model focuses on cumulative changes in organizational entities across communities such as industries; change occurs through the continuous cycle of variation, selection, and retention (Van de Ven and Poole 1995).

With regard to the development of a process model for the IT dis-integration process in the context of the corporate demerger, there are two points of view that influence the choice of process model. On the one hand, the IT dis-integration process model consists of developmental activity, as the IT team most commonly has limited or no experience in how to disintegrate an IT environment. In addition, the legal requirements prescribe a sequence of events up until a certain point of the dis-integration activities. Consequently, a life-cycle model seems closely related to the analysis that will follow.

On the other hand, IT dis-integration activities can also be characterized by a clear desire to accomplish pre-defined goals. As the case will show, the final goal of IT independence was broken down into milestones or sub-goals that had to be achieved in a sequential order. This purposeful approach to IT dis-integration rather suggested the application of the teleological-grounded process model.

Following the two forces impacting the process of IT dis-integration, the legally required institutional sequences (life-cycle process theory) as well as IT activities driven by the achievement of milestones (teleological process theory), the IT dis-integration process is based on a dual-motor process theory. Following the recommendations of Van de Ven and Poole (1995), the IT dis-integration process can be identified as one that reflects an interaction of the life-cycle and teleological process models.

Research Methodology

As process research is concerned with the understanding how things evolve over time and why they evolve in that particular way (Langley 1999), process data often consists to a large degree of stories about what happened and who did what when as well as tracking events, activities, and choices made over time. As stated earlier, the process model approach seeks to understand how the process affects the outcome as well as how and why certain outcomes are achieved within a given set of antecedent conditions. Similarly, qualitative research identified that case study methodology is particularly useful for answering research questions related to how and why (Yin 2003).

Case studies are also suitable for theory building in areas where existing theory is limited (Eisenhardt 1989). Theory and model development can be based on a single case study (Lee and Baskerville 2003; Yin 2003). Bonoma (1985) highlights that case studies can facilitate in-depth analysis of complex and ill-researched phenomena. Case studies can provide insights where in-depth understanding of a phenomenon in its context is desired (Benbasat, Goldstein, and Mead 1987). As case studies are especially useful for exploratory research where in-depth understanding of a phenomena in its context is desired (Yin 2003), process model research and case study research also complement each other with regard to considerations of context: "…one of the main reasons for taking a qualitative process approach is precisely to take into account the context" (Langley 1999, 692). Consequently, case studies are a good way to illustrate the use of process models (Robey and Newman 1996), and case studies represent a preferred approach for process-oriented studies (Langley 1999).

An in-depth case study served as the empirical basis of this research and was used to develop the process model of IT dis-integration. This study uses data from IT dis-integration in the context of a demerger in a financial service firm. Since the emphasis of the current work relates to understanding events, sequences, driving forces, and impediments within an IT dis-integration process, a descriptive case study was used (Myers 1997; Dube and Pare 2003). The choice of the case was based on the principle of theoretical sampling, which specifies that chosen cases should clearly represent the phenomena under study in its natural social context (Yin 1981; Mason 2002). In accordance with these principles, the author judged the recent demerger of the Financial Service Firm to be an appropriate site for gathering retrospective data about the IT dis-integration process. The following work represents an in-depth single case study design that holistically documents an IT dis-integration.

Research Context and Site Selection

The chosen case for this study was the recent demerger site of a financial service firm in the United States. All names, including the names of people, are pseudonyms. This company was selected because it had recently experienced an IT dis-integration of its entire IT landscape due to a corporate decision to demerge parts of the business. The IT environment prior to the demerger was tightly integrated with regard to all IT resource types: people, systems, and hardware. In addition, the existing system portfolio consisted of forty percent commercial solutions, while sixty percent of the systems were homegrown legacy systems or customized solutions. This caused a complex challenge for the IT team in order to establish two separate IT environments for the new legal entities.

Data Collection

The Chief Information Officer (CIO) of the Financial Service Firm provided entry to the author to conduct demerger related IT dis-integration fieldwork at the company site. This circumstance bestowed immediate “legitimacy and credibility” to the researcher (Patton 1990). One of the former managers of the IT dis-integration initiative provided the researcher with assistance by setting up face-to-face meetings, telephone interviews, and informal meetings (i.e., lunches and dinners). Permission was also granted to access the entire knowledge database, a lotus notes archive containing among others things meeting protocols, status reports, and presentations that the IT dis-integration team had been building since the start of the demerger considerations.

Data was collected one year following the completion of the full IT dis-integration using semi-structured interviews with employees. All data was collected retrospectively, direct observation was confined to practices and behaviors present during the author’s on-site visits to the company to conduct interviews and collect other data. In accordance with Yin (2003) a case study database was used to keep track of and organize data. Bias is a concern in retrospective data collection. This risk was addressed by triangulation within and between different data sources, the use of a timeline to arrange data and build a coherent story, as well as the formulation and assessment of alternative considerations (Yin 2003; Golden 1997). In addition to retrospective interviews, internal documents from the Financial Service Firm that were stored in the knowledge database were used as sources of data (Myers 1997; Yin 2003), as were external publications related to the demerger.

Thirty-five interviews were conducted with executive management, senior management, and the IT dis-integration team. Table 1 lists the roles of respondents and the number of interviews conducted. In order to allow the reader to appreciate the role and responsibility of individuals who are quoted while maintaining their anonymity, the author uses the following naming convention (see also Sarker and Sarker 2009): <company: FSF – Financial Service Firm> <position and number: to distinguish between individuals in the same location, the same position, and IT and Business Area related>. For example, <FSF.DM9> refers to the department manager of legal affairs who was responsible for the transition service agreements (TSAs) during the IT dis-integration.

The interview protocol contained a series of open-ended questions to encourage the discussion of topics (Mason 2002; Rubin and Rubin 2005) relevant to the events, tasks, challenges, and project management of the IT dis-integration. Interviews generally lasted 60 minutes. All interviews except four were audio recorded and transcribed, and the interviewer wrote notes during and immediately following each interview. In addition to interviews, the author engaged in casual conversation before and after interviews with the IT management team as well as with a number of sub-project managers. The author was also given full and unlimited access to the project knowledge database, which stores all documents ever created in the context of the IT dis-integration. Also the author searched for and reviewed external publications with regard to the demerger of the Financial Service Firm in specific.

Respondent details	**Primary role**	**IT separation project role**	**Number of formal meetings/interviews**	**Other informal interactions**
Chief Executive Officer (FSF.CEO)	Top Management	Sponsor, Steering Committee	1 (in person 09/11/09)	0
Chief Information Officer (FSC.CIO)	Top Management	Sponsor, Steering Committee	1 (phone 05/18/09)	0
Vice President of Sales (FSF.VPS)	Top Management	Sponsor, Steering Committee	1 (in person 09/11/09)	0
Senior Manager (FSC.SM1)	Senior Manager Application Development	IT Project Management Leader of IT Separation	5 (phone 07/24/09, phone 05/01/09, in person 09/09/09, in person 09/10/09, in person 12/10/09)	7 (phone chat 05/08/09, phone chat 07/24/09, lunch 09/09/09, evening chat 09/10/09, lunch 09/11/09, breakfast 12/09/09, dinner 12/09/09)
Senior Manager (FSF.SM2)	Senior Manager, IT Operations	IT Leader of Demerger, Negotiation Team and Contract Work	1 (in person 12/10/09)	0
Senior Manager (FSF.SM3)	Senior Manager Infrastructure	IT Sub Project Management of IT Separation, Leader of Infra. Sub Project	2 (in person 09/09/09)	2 (phone chat 05/08/09, lunch 09/09/09)
Senior Manager (FSF.SM4)	Senior Manager, IT Operations	IT Leader of Logical Separation	2 (in person 09/09/09, in person 12/10/09)	1 (lunch 09/09/09)
Senior Manager (FSF.SM5)	Senior Manager Operations	Business Project Management Leader of IT Separation	2 (in person 09/09/09, in person 12/09/09)	0
Department Manager (FSF.DM1)	Department Manager	IT Work Stream Leader, Infrastructure	1 (in person 09/09/09)	0
Department Manager (FSF.DM2)	Department Manager	IT Work Stream Leader, Applications	2 (in person 09/10/09, in person 12/09/09)	1 (evening chat 09/10/09)
Department	Department	IT Work Stream	1 (in person 09/10/09)	0

Manager (FSF.DM3)	Manager	Leader, Big-Bang Launch Event		
Department Manager (FSF.DM4)	Department Manager of Business Operations	Business Work Stream Leader, Testing	1 (in person 09/10/09)	0
Department Manager (FSF.DM5)	Department Manager IT PMO	IT Coordinator of the Project Management Office	3 (in person 09/11/09, in person 12/09/09, phone 12/10/09)	1 (breakfast 09/09/09)
Department Manager (FSF.DM6)	Department Manager and Project Manager	IT Work Stream Leader, 3rd-Party Connectivity	1 (phone 09/11/09)	0
Department Manager (FSF.DM7)	Department Manager and IT PMO	IT PMO Member	2 (in person 09/11/09, in person 12/09/09)	0
Department Manager (FSF.DM8)	Department Manager and Project Manager	IT Project Team Member, Applications	1 (in person 12/09/09)	0
Department Manager (FSF.DM9)	Business Department Manager, Legal Affairs	Business Leader for TSA	1 (in person 12/10/09)	0
Team Lead (FSF.TL1)	Team Leader and Project Manager	IT Project Team Member, Infrastructure	1 (in person 09/10/09)	0
Team Lead (FSF.TL2)	Team Leader and Project Manager	IT Work Stream Leader, License Agreements and TSA	1 (in person 09/10/09)	0
Team Lead (FSF.TL3)	Team Leader and Project Manager	IT Work Stream Leader, Change Management	1 (in person 09/10/09)	0
Team Leader (FSF.TL4)	Team Leader and Project Manager	IT Work Stream Lead, Lotus Notes	1 (in person 09/11/09)	0
Team Leader (FSF.TL5)	Team Leader and Project Manager	IT Work Stream Lead, Data Separation	1 (in person 09/11/09)	0
Team Leader (FSF.TL6)	Business Team Leader, Legal Affairs	Business Support for TSA	1 (in person 12/10/09)	0
Analyst (FSF.A1)	Communication Analyst	Business Co-Work Stream Leader, Communication	1 (in person 09/10/09)	0
Total			35	12

Table 1: Interview Details

Data Analysis

As stated prior, process research is concerned with understanding how things evolve over time and why they evolve in this way (Langley 1999). Therefore, process data consist largely of stories about what happened and who did what when, as the in-depth case study data shows. However, over one thousand pages of interview transcripts, field notes, project documents, and external publications had to be analyzed to identify events, activities, and decisions ordered over time. Only then could the data provide the foundation for process theories and offer explanations in terms of sequences of events leading to an outcome (Mohr 1982). Key to the development of a process model is the understanding of patterns in events.

Langley (1999) offers sevens strategies for analyzing process data in order to make some sense of the vast amount of data and identify events and sequences of events: (1) narrative strategy, (2) quantitative strategy, (3) alternate template strategy, (4) grounded theory strategy, (5) visual mapping strategy, (6) temporal bracketing strategy, and (7) synthetic strategy. These seven strategies can be combined or used discretely, depending on the form of data collected.

Following Pentland (1999), the theory of narrative considers that an explanation is a story that describes a process, or sequences of events, that connects causes and effects. Here, good stories are central to building a good theory. This type of analysis is especially well suited for the development of process theory, as the stories help to explain the relationships between events. With its focus on time as an anchor point and the strong dependence on stories, narrative strategy is well suited for making sense out of complex and rich case-study data (Maehring and Keil 2008). In addition, a timeline can be used to arrange data chronologically (Mason, McKenney, and Copeland 1997). Following these recommendations, the author first made herself intimately familiar with the case and collected data (Eisenhardt 1989) by reading transcripts multiple times, with temporal breaks in between to get a fresh take on the data. The researcher reviewed all collected documents, field notes, and external publications multiple times in order to develop a basic timeline that allowed her to arrange data chronologically. The review process provided the basis for writing a case narrative. This study followed Pentland's (1999) guidelines for narratives, considering his five typical features of a narrative text: the sequence of time, the focal actor or actors (key people influencing the IT dis-integration), the identifiable narrative voice (the researcher), an evaluative frame of reference (a successful demerger of a corporate entity), as well as other indicators for content or context. A narrative of the IT dis-integration process in the context of demerger will follow in the case analysis section of this paper.

In addition to narrative strategy, this study applied a visual mapping strategy for the analysis of process data, as recommended by Langley (1999). Miles and Huberman (1994) identified that graphical forms have several advantages over the pure narrative approach as they allow the presentation of large quantities of data and information in relatively little space. As such, they can be useful instruments for the development and verification of theoretical ideas. Langley (1999) pointed out that graphical representation can be especially helpful for the analysis of process data as it allows the simultaneous representation of a large number of dimensions. At the same time, graphical representations can be used to show precedence processes and the passage of time. The graph itself is obviously not a theory but an intermediary step between raw data and a more abstract conceptualization. Visual mapping focuses on events and their timely order; however, the display will lack accuracy and detail compared to the narrative. A visual map of key events including additional findings will be presented in the following section of this paper.

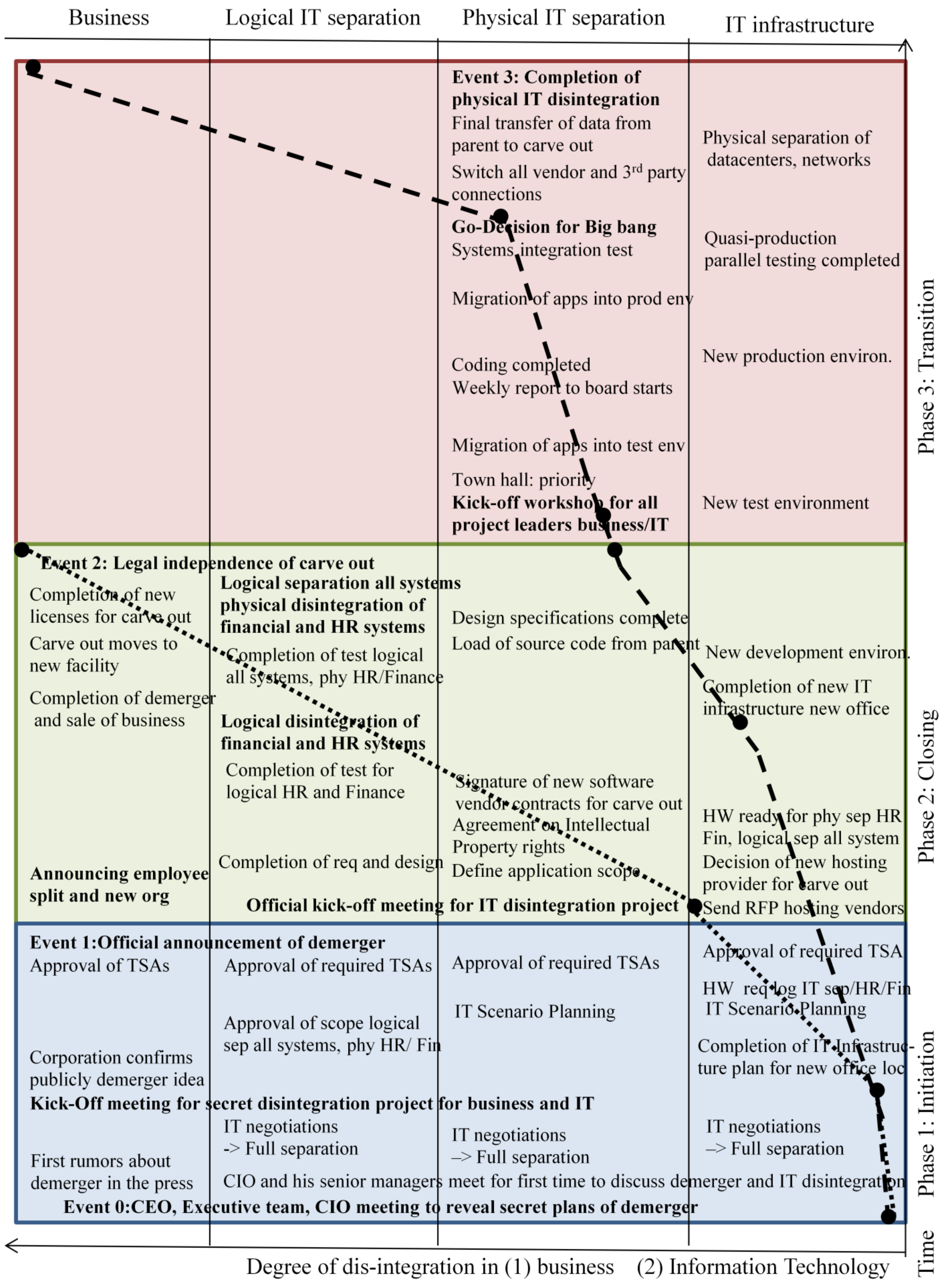
In a final step, in order to allow development from narrative and visual mapping to process model development, the author applied Langley's (1999) recommended strategy of grounded theory in the sense of applying an open coding technique to the qualitative data. In information systems research, grounded theory has proven to be extremely useful in developing context-based process-oriented descriptions and explanations of information systems phenomena (Myers 1997; Urquhart, Lehmann, and Myers 2009). An open coding technique was applied to learn from the data itself as postulated by the grounded theory approach (Strauss 1987). This was a rather subjective process as the author chose the code concepts on which to focus (Walsham 2006). Overall, the open coding of the qualitative data was supported by using ATLAS.ti software, which allowed the author to link themes to specific pieces of text in the transcripts. Throughout the data analysis, transcripts from the interviews as well as field notes, documents from the project knowledge database, and external publications were consulted for triangulation purposes (Yin 2003). The identification of initial codes, constant comparative analysis between coding approaches, visual mapping, and narrative were used to understand this case of IT dis-integration at a higher level of abstraction and to depict conceptualizations of phases, transitions between phases, and impediments (Charmaz 2000).

Moving from narrative and visual mapping towards the development of a process model, the author continuously reviewed case data and identified key events in the IT dis-integration project. During the continuous analysis, three distinct phases were identified. The identification of phases was based on detecting time periods within which events were more uniform than in other phases (Maehring and Keil 2008). Also, key events that formed either the beginning or end of these distinct phases were identified. These key events were associated with triggers or underlying motors (Van de Ven and Poole 1995) that move the process from one phase to the next. The process model for IT dis-integration will reflect these three main phases as well as initiatives that were specific to each phase, phase-related impediments that were specifically forceful during the individual phases, transition triggers, and the underlying motor (Van de Ven and Poole 1995) of the movement from one phase to the next.

Case Analysis

A mid-sized Financial Service Firm (FSF) located in the United States decided five years ago to demerge parts of its business motivated by the objective of increasing business performance. In order to complete the demerger, the company had to separate the carve out business and dis-integrate its IT environment. The following paper describes the information technology and system dis-integration initiative, highlighting key events that resulted in distinct phases of the IT dis-integration process. A visual map of key events and their related phases is provided in Figure 2. The map is structured by the four main areas of demerger activities related to IT dis-integration: the overall business initiatives, the logical separation of IT, the physical separation of IT, and the IT infrastructure. In addition, the visual map indicates the three major process phases of IT dis-integration: initiation, closing, and transition. The figure also contains two lines that indicate the level of completion with regard to business dis-integration and IT dis-integration over time, clearly differentiating the two separate transition activities, as well as highlighting key events that triggered the level of completion and movement between phases.

Figure 2: Events of the Demerger



Antecedents

A strategic corporate decision to demerger the Financial Service Firm and to create two legally independent business entities in order to increase financial performance caused the need for the dis-integration of the existing information technology (IT) environment. The Financial Service Firm had a tightly integrated application landscape that was supported by a dedicated in-house IT organization. The applications and data were hosted in the firms' own datacenter which was also supported by its in-house IT team. All business units shared the same systems including the point of sales, credit scoring, financial portfolio management (loan and financing), customer service, loss recovery, business intelligence, and administrative support systems, to name a few. The system portfolio deployed standard software in less than forty percent of its landscape. The rest were custom-designed legacy systems that were built and supported by the in-house IT team.

> *FSF.SM2: "Parent and carve out had a highly integrated IT landscape that needed to be separated. Almost all systems were shared, running on one IT infrastructure."*

When the chief executive officer of the Financial Service Firm called in his executive team including the chief information officer, the need for a complete separation of the IT environment in the context of the demerger decision was clearly stated. This meeting led to the start of phase one of the IT dis-integration process. Overall the division of the IT dis-integration process into the three phases is based on major events as well as the circumstance. Specifically, phase one is clearly separated by the aspect of secrecy, as during this pre-demerger phase the plans for a future demerger have not yet been announced. The dynamics of the IT dis-integration change with the official announcement of the demerger leading into phase two of the IT separation. Phase two of the IT dis-integration centers around the achievement of legal requirements in order to allow the closing of the demerger deal. Consequently phase two closes with the signature of the demerger contract and the legal independence of the two business entities. Phase three is kicked off with the closing of the demerger deal, shifting the focus of activity now on the completion of the IT dis-integration. Phase three ends with the achievement of the final outcome, the complete separation of the entire IT environment of the Financial Service Firm. One of the senior managers comments on the phases he experienced during the IT dis-integration:

> *FSF.SM5: "But one [phase] was much more about systems, and one was much more about processes, people, and legalities, and that is a huge difference between the two [phases]."*

Phase 1

The first phase of the demerger started with a meeting the Chief Executive Officer (CEO) called to inform the executive team as well as the Chief Information Officer (CIO) that the board had made the decision to demerge parts of the company. The CEO asked the team to start initial planning and preliminary preparations for the dis-integration of the business. From the beginning the CEO placed a high priority on considering how to dis-integrate IT, as he was aware that his business depended highly on it. The CEO recalls:

> *FSF.CEO: "From the beginning of the demerger consideration and first negotiations, IT was a core topic of the negotiations. Who owns the current IT environment and how will IT be separated to allow both firms to function in the future?"*

Following the meeting with the CEO, the CIO pulled his most senior managers together in secret to inform them about the upcoming events and to get their input on how to succeed.

> *FSF.SM2: "Shortly, within several days, [after the executive meeting] the CIO called me and [the head of IT infrastructure and the head of IT applications] in. The three of us were brought in to really look at what needs to happen here to sell and separate our company."*

As a first step, the team discussed possible ground rules for how the two parties of the demerger could operate during the IT dis-integration. To the negotiating parties the IT team proposed some ground rules related to IT to provide a platform for further IT dis-integration scenarios and separation activities. In the current case the demerger partners negotiated that the parent company would keep the fully functional IT landscape, including all infrastructure and the support team as it existed prior to the demerger. However, IT's intellectual property (IP) would be co-owned and allow the carve out to draw source code of existing systems and separate its data from the current environment. All existing software license agreements would need to be changed and applied to the parent as well as to the carve out as they would be separate legal entities. It was also agreed that, after a transition phase, the carve out and parent would have separate IT landscapes and organizations. This early contractual agreement established the need for a complete physical separation of the existing IT environment as the final outcome.

Similar to prior literature, the current case identified **physical dis-integration** as the operation of applications on separate systems and separate infrastructures; there is no layer of connection between parent’s and carve out’s IT systems. On a somewhat related note, **logical dis-integration** was identified as the parent and the carve out still running the same application on the same systems and infrastructure; however, access was restricted to entity-related data and systems only.

However, for the parent company there would be no major changes with regard to its information technology and systems. The carve out would carry the entire load to achieve a complete dis-integration of IT between the two firms. The dis-integration activities of the IT organization would need to allow the parent company to continue to run their IT applications and infrastructure while the carve out needed a basic team to manage the transition phase and build an independent IT organization and environment. During the transition phase the parent company would provide IT services to the carve out based on transitional service agreements (TSAs).

> *FSF.SM2: “The parent gets it all. They get the existing IT landscape, they get the building, and they get two thirds of the people. The IT intellectual property, this was the key thing here in the negotiations. The intellectual property will be co-owned by parent and carve out; the source code will be made available to both companies. This was very key, any of the in-house developed IP we said, we jointly own. We both have access to it so when we separate, we can take a copy*

and go our own way and modify, move, etc. and everybody of the two firms can do the same. That was very, very key, probably one of the more pivotal things to put on the table here."

This contractual baseline set from the beginning the clear expectation that the IT environment shared by the demerged firms would be fully dis-integrated at some point in the future. Given this contractual base line agreement for the separation of IT, the leadership team secretly extended the team to include some required IT experts in order to consider various scenarios for how best to accomplish the agreed complete dis-integration of IT. A completely new IT environment was required for the carve out in order to fulfill the contractual agreement that the parent would keep the entire existing IT environment. However, the need for secrecy, to keep the information about a demerger plan out of the public eye at that time limited the chief information officer and his management team from pulling in all of the required IT experts. Only a very small team of IT experts was included in the secret pre-demerger considerations and planning.

FSF.DM1: "In the beginning it was kept secret and we had a very small number of people that were brought into the project, at that point in time it was just called scenario planning, … so in those early days I was brought in for the infrastructure, and we created the RFP [Request for Proposal] for the new data center."

To ensure the secrecy of the people involved early on in the demerger planning, the company required everybody who got involved to sign non-disclosure agreements prior to being told what was going on.

> *FSF.DM9: "We were pulled in early in secrecy, had to sign non disclosure agreements, before we started to work out what transitional service level agreements were required to bridge the transition periods."*

Given the limited team of IT experts the CIO was able to include in the secret demerger plans, the team lacked certain expertise. The limited number of people involved in these early days of IT dis-integration and the circumstance that a demerger presented a rather unfamiliar activity for the management presented the teams with many challenges. The Financial Service Firm, like most firms, was not accustomed to conducting demergers on a routine base, and this led to a lack of knowledge and experience on how to proceed with the demerger and the IT dis-integration that was required. The CIO approached this situation by pulling his most senior experts together, discussing the options, deciding on the best way forward, and leaving them with their individual areas to consider the dis-integration in more detail with regard to people and the organizational split, the split of infrastructure, and the split of applications.

> *FSF.SM2: "We didn't understand what really was going on with respect to the sale. This was all new frontiers on all of us in IT, but we did get together, and we broke up the team into responsibilities. My area would be the organization and people. [The head of infrastructure] would be infrastructure, and [the head of applications] was given application landscape."*

However, even for the most experienced people in the IT team, a separation of their environment was still something new, something with which most of them lacked any prior experience.

FSF.TL5: "When we started first talking about dis-integration, there was so much we did not know. So, it definitely evolved, because you know we only came to learn about sharing of data …."

FSF.SM2: "I can tell on the IT side though that there was an idea and then developing executable plans to the idea was really what we did for the first several months. It was not clear at all. For everybody, if you work at a company like ours, your expertise is not in mergers and acquisitions."

In order to get a better grip on what needed to be done and by when, the IT team reached out and met with the legal team involved in the demerger negotiations. Their aim was to get a basic understanding of what would be legally required as a minimum by a certain date and what would impact the IT dis-integration plan with regard to high level milestones.

FSF.SM4: "We sat down with legal and said what is the minimum that we need to do for the completion of the demerger deal and what is it that we can do after, post demerger deal."

FSF.SM3: "The legal minimum requirements were to have separate books on the day of signing the demerger contract … then discussions started about physical separation, how do we put together a strategy towards separating all systems. Now that obviously takes a little bit more time."

Based on the lack of experience with regard to demergers and IT dis-integrations, the CIO also pulled external consultants into the small team of IT experts.

FSF.SM1: "The external experts would say, well you are going to need to do financial separation. Well then we said, okay let's have [the IT manager] sort of pull the people together, and let's figure out what needs to be done there. And she sort of directed that, and then, yeah, we thought we were kind of done. And then along came well, no, you have to have logical separation and the systems you got a need to get in here and change your access for each other …."

The consultants' suggestion was a commonly used risk mitigating approach where logical separation is achieved first. Then the physical separation of the IT environment would be a stepwise approach where applications are clustered, and one cluster after the next would be physically separated over time. This way of separation would have taken a considerable amount of time and money. The CIO did not agree with the approach, as he believed the IT team would never see the end of complete separation. Also, the physical dis-integration of systems into clusters would require the development of temporary connections between the systems, and experience shows that such lengthy IT projects will die at some point due to the lack of financial funds and support from the business.

FSF.CIO: "The consultants recommended a multiphase, two- to three-year project, easily costing us more than $100 million. They said our idea would be too risky to transfer all the systems and data at once."

However, the in-house experts from IT felt confident that they would succeed in their more aggressive approach in order to dis-integrate the IT environment. The final scenario for the IT dis-integration entailed:

(1) Fulfillment of minimum legal (contract and law) requirements in order to close the demerger. This was identified to be the logical separation of all systems and a physical separation of the financial and the human resource systems.

(2) A big bang approach for the physical dis-integration of the entire IT environment. All systems and data would be physically separated in one step.

In addition the IT team had to consider:

(3) Creation of a new infrastructure for the carve out in order to enable logical and physical separation of the IT environment as well as an infrastructure for the carve out's new facilities, which would be in another location.

This approach allowed the IT team, on the one hand, to fulfill legal requirements in order for the demerging parties to sign the demerger contract. However, it also allowed the IT team a longer amount of time to complete the more time consuming and complex task of complete physical dis-integration of the entire IT environment.

FSF.SM2: "The goal was to achieve independent operations and legal compliance first, followed by a rapid separation of the IT."

Following the decision about the scenario for the IT dis-integration, the individual IT experts that had signed the non-disclosure agreement started their more detailed work in order to prepare plans and milestones for the upcoming IT dis-integration.

This first phase of scenario planning was completed when the firm officially announced its decision to demerge. The official announcement allowed the core IT team to pull in all the required resources in order to start the execution and implementation of the IT dis-integration scenario.

Phase 2

The official announcement of the demerger came as a kind of shock for many employees, as only a very limited number had been part of the prior scenario planning phase. So, following the official announcement of the demerger, many employees were in a stage of disbelief.

> *FSF.DM8: "If I have to say one of the top challenges in the early stages of this IT dis-integration was kind of the shock to everybody. People were still trying to understand, like, what does this mean, what are the executives talking about splitting our company, and things like that. Not everybody was fully engaged. So, that was one of our main challenges trying to make it easy on people. At the same time we have deadlines, we need to get things done."*

However, the "clock was ticking" and the required activities for the dis-integration of business and IT had to be executed and implemented. IT managers were finally able to inform their teams about the details of what was going on with regard to the company overall as well as what was required from the IT area and their respective IT teams.

> *FSF.SM4: "The first thing I did was to bring all of my project leads who would report [during the IT dis-integration] to me into one room and identified … okay we need to do this for day of demerger contract signature and deal completion. Then said this is the end date, how do we plan for it, and we planned for it …."*

Shortly after the official announcement of demerger plans, the CIO scheduled a big kick-off meeting to get the IT dis-integration projects fully started in order to work out the details and start executing the plans.

> *FSF.SM2: "There was a large workshop …. We had a very, very large gathering in a conference center …. We broke people up into logical functions and started talking through the concepts …. The IT people started to define the requirements. We knew we had developed the high level milestones, but we didn't have the details. So we knew conceptually that we had to separate the financial and HR first logically than physically, and we knew we had to separate all systems first logically and ultimately physically. All that was very clear and all this [was] wrapped in the notion that you had to continue to work and run the business as well."*

As the first major milestones were to fulfill the requirements in order to achieve legal independence for the two companies and close the demerger deal, the IT teams had no flexibility with regard to timelines. The deadlines were given.

> *FSF.SM4: "During the separation of financial systems and HR you had a strict timeline. You had an end date and you kind of were working backwards in terms of planning your milestones and everything."*

> *FSF.SM2: "The message here was push, push, and push. Yes we can. Yes we can. Where ever we had a road block, get around the road block, do whatever you need to do to get this thing done. The short term logical separation was an*

ambiguous requirement. This intermediate step was to create the appearance of two companies and get the legal independence."

In addition to facing time pressure, the employees in the IT area and elsewhere in the company were working in a state of personal tension. Since the announcement of the demerger, everybody was aware that the work force would be split into parent company and carve out. Given the integrated business of the company, however, it was not clear to the individuals which one of the two future entities they would belong to. In the first few months, people in IT were working on the separation of the business and IT without knowing on which site they would be later be working.

FSF.DM8: "… trying for people to think objectively and trying to come up with ideas irrespective of don't worry about where you are going to be, but as a company we need to do this right now. So, that was one of the challenges we faced."

The senior management level had worked during the scenario phase on new organizational structures for the two companies and had discussed in secrecy which employees would work for which company in what positions. The requirement for both parties was to ensure a fair division of knowledge and talent amongst the employee workforce for the two future companies.

FSF.DM9: "All of the senior managers had to split their teams. Like we went into a room and we had a kind of listing of our employees, and we said, both teams need to be strong, you know, you can't give one team all the low performers and *one all the high, and when we did that we did not know ourselves on which team we were on…."*

After the official announcement of the demerger, the employees were informed individually by their managers about which future company they would belong to and in which position they would work. One of the managers in IT recalls:

FSF.SM2: "We went through a big ceremonial calling everybody in one day.... Everybody was told in private on what team he/she is on. Nobody was given a choice. If they wanted to switch sides they had to find some other colleagues who wanted to trade sides with them."

However, even the announcement of who would work for which company in the future carried its own employee-related challenges.

FSF.TL6: "It was very emotional, because we all had friends that were staying behind…."

FSF.SM1: "The time after people had heard what side they are on was gut wrenching … many people cried."

FSF.SM5: "There was a lot of emotional pain with this separation and I cannot even describe it, the people I left behind that I knew my whole career, so many years of my life … there were a lot of tears … emotions people crying in the hallways."

The personal feelings of loss and separation were intensified when the carve out moved to its new facilities.

FSF.DM2: "At the point when we became physically separate, that's where it sank in, oh we are a separate company. When you are sitting there with people you have worked with for ten years nobody really had that sense. So as the move was coming, at this time when payroll and all the financial stuff got separated, that is where we really became a separate company."

FSF.DM8: "Moving to the new building was a notable event, that was a reality check for everybody, that we are not in the same building any more, we are not with the same people any more. That is when some of the challenges started to kick in, because we still had to work with people down the road till the physical separation of IT was completed."

During all this personal turmoil of being separated from their colleagues and being moved to new facilities, the IT team of the carve out had to continue its IT dis-integration activities in order to allow for the closing of the demerger. As agreed in the scenario planning, the financial and human resource systems had first to be logically separated in order to allow for the signing of the demerger contract and the logical dis-integration of all IT systems, which then allowed for the legal independence of the two firms.

FSF.SM2: "Logical separation was all about information access separation. Making sure that people servicing accounts can only see accounts that are part of their company, because we were all still in one IT landscape."

In addition to the main milestone for the IT dis-integration in phase two, to close the deal, the IT team also had to continue its efforts to set up a new IT infrastructure for the carve out to enable the physical dis-integration of the entire IT environment.

> *FSF.SM1: "While, you know, some IT managers kind of still focused on the logical separation, you know, the pieces that had to be done legally. So all of us were working on things like new license agreements and stuff that were very painful pieces for the completion of the physical separation."*

The limited IT human resources of the carve out were stretched very thin during this challenging phase of IT dis-integration. The separation of people into different companies and the relocation of the carve out teams took their toll, and people started to focus very narrowly on the next, most time pressing task.

> *FSF.DM2: "When I came into the project I came basically only to work on the physical separation…. So I was part of the original people that started thinking about the physical separation, while the rest of IT was busy working in the beginning on the separation of financial systems and HR as well as the logical separation. That created problems for us, because once we had a plan and wanted to communicate it out to the larger IT staff, you know basically their attitude is you know I have been working 12 to 14 hours a day on the separation of finance or HR, now the logical separation will launch in a few days and I cannot even think about the physical separation yet…."*

In the end the IT team of the carve out, with the support from its former colleagues from the parent company's IT team, succeeded in accomplishing the physical dis-integration of the finance and human resource systems and the logical dis-integration of the entire systems portfolio. Given their prerequisites as well as other business related topics, the demerging partners were able to announce legal independence of the parent and carve out companies.

Phase 3

With the completion of legal independence, all focus should now have been on the final step of achieving full independence for the carve out. The last connection that remained was the IT systems and infrastructure.

> *FSF.DM2: "[After the physical move of the carve out team to a new location] we now really were separate companies, but the reality was we were in separate buildings, but until we have our own systems we weren't really running our business."*

The IT team scheduled a big kick-off meeting to rally the troops for the final step in the demerger: the complete physical dis-integration of the IT environment. All the scenarios and decisions for how to go about the physical separation had already been worked out. The core team was ready on the day of the kick off to share with the rest of the IT project team what needed to be done with regard to major milestones and how they would organize the team in order to succeed.

> *FSF.SM3: "After the achievement of the legal independence I switch over to the project of physical separation. However, the planning for that had started much earlier. Negotiations with software vendors or set up of a new data center were well under way when the general kick off happened."*

Without that prior work of planning, strategizing, and structuring, the team would have never been able to reach a physical separation of IT within the next six months. Also, the IT infrastructure was already set up with a development and testing environment at the time of the kick off so that developers could get started right away on the work of moving their applications to the new environment.

> *FSF.SM5: "We did a huge off site kick off meeting in a conference center and we had big round tables and we had the work streams and everybody started to sit down and say, okay what do I have to do, and they started to draft more detailed project plans. So each work stream drafted project plans and then we looked at them together and we integrated them and so we knew that these people grasp what they had to do to manage lotus notes or third party vendors or the portfolio system. So then we put all that together and massaged it back and forth up and down from bottom up top down until we got it to the point where we had a detailed plan we needed to hit within the given time frame."*

In addition, the kick-off meeting made it clear that it was not only IT's initiative to physically separate the IT environment; business also had to take ownership of this final step of the demerger. Business partners, amongst others, were required to test the separated systems as well as to reconcile the separated data. However, when IT tried to engage their colleagues from the business side, there was a lack of understanding of the complexity and urgency of the physical separation of IT. Many of the IT employees had been working feverishly on the IT dis-integration, while most of the people on the business side started to go back to business as usual after the closing of the demerger and the move to the new facility. For business, the demerger contract was signed, and they had moved on to a new location with a new company name.

> *FSF.SM5: "We were starting to talk to all these people and try to get them to understand that this is a really big deal because from the business side they were like … we are over here we want to start you know a new business. And we were telling them, no you cannot start your new business yet, you can't make changes, and you cannot do any of these things that you want to do because we still have this big job of getting the systems over and separated."*

In the end the CEO stepped up to convey the urgency of the situation and that all employees of the carve out had to pull together one more time in order for their new firm to be able to survive.

> *FSF.CEO: "We do not have our own company unless we have completed the physical IT dis-integration. This is everybody's number one priority over the coming months."*

The executive team decided to hold an all hands meeting (a town hall) for the carve out in order to communicate to everybody the importance of the IT physical dis-integration and the need for everybody to make this their major priority over the next six months.

> *FSF.DM8: "The town hall motivated everybody to think positively and try to do the right thing. There were a lot of people who were still thinking that, hey, I should be on the other side. There was lot of those things still going on."*

The town hall meeting also allowed the executives to re-enforce the need for business and IT to work jointly on the physical IT dis-integration project. Even so, the physical dis-integration of IT could not be accomplished without support from the business side.

> *FSF.SM5: "Our CEO got up in a town hall meeting together with our CIO and COO and made it clear it is not IT does this, or business does that, you are all in this, we are all in this, together."*

> *FSF.DM8: "When we had that first town hall as an independent legal entity, that was the biggest, biggest turner…. Probably from that point onwards we never looked back, we knew at that time we are going to work on this together [IT and business] as a single big project to reach our complete independence."*

In addition to the motivational challenges, the division of the workforce created the need for temporary solutions in the third phase. The complex IT work to disentangle all systems, applications, and data required knowledge of all existing systems and applications. However, the reduced IT team of the carve out did not necessarily have subject matter experts for all systems and applications onboard.

> *FSF.DM2: "You know we only kept 30% of the IT people with the carve out, 70% stayed with the parent company … so in some systems, you know, the big part of the expertise came to us, and then in other systems the big part of the expertise remained with the parent. So there [was a] gap to be closed on both ends from system expert depending which company they were with."*

Even so, the managers tried to ensure that talent and knowledge were split equally. Being left with only one third of the prior IT people and their expertise created a major loss of knowledge for the carve out IT team. The demerger parties tried to bridge the knowledge loss with transition service agreements that allowed the separate teams to learn from each other and re-establish all required knowledge.

> *FSF.DM9: "TSAs were not only IT related but also business related. One of the reasons for business related Transitional Service Agreements (TSA) was as well we had a big resource gap at the carve out. I mean you split a company in two, you do not overnight re-staff all of your gaps in your positions. We had TSAs to fill those gaps as well."*

In phase three the complexity for IT was much higher than in the previous phases. The team grew from an original of 20 to 30 people during financial and HR system separation to almost 100 for logical separation and close to 300 for the physical separation.

> *FSF.DM7: "In terms of the number of people that were involved compared to, I want to say, the separation of financial and HR systems, as well as the logical separation, the two combined IT, the number of IT people involved were about less than 100. But in the physical separation in the end it was close to 300. It was much bigger in scope and size."*

The bigger team was required in order to set up an entire new data center and infrastructure. Every IT application had to be reviewed, source code had to be copied, and codes had to be changed and moved into new IT infrastructure, which itself had to be tested and reconnected.

> *FSF.SM3: "When you move to a new data center the tool set isn't the same. There were proprietary solutions in the parent company's data center that our carve out data center vendor did not know and would not be able to use. So we would have to make changes to the systems to accommodate those new tools."*

> *FSF.SM1: "We were basically changing all this code extensively in all systems, as only portions of the old company remained. We had to change the data that comes in, the vendor that supplies it. Changes were too extensive to just pretend it was a copy and paste approach."*

In order to manage the level of change, complexity, and effort, the IT team agreed to simplify the physical separation as much as possible by agreeing to some ground rules. The systems would come over "as is" with regard to their functionality. Any re-engineering and improvement of systems as requested by the business side would need to wait until after the completion of the physical IT dis-integration.

> *FSF.SM2: "The concept was to achieve independent operations through physical separation of the IT as quickly as possible. That meant a replication of the existing IT landscape and no changes to functionalities, but separate physical infrastructure. We put down ground rules saying, don't talk about improvements. We are going to bring over any cranky, old system. We're going to bring it over as is, because we are going to do it quickly. So that was another key concept here is that there will be no re-engineering."*

Nevertheless the physical dis-integration of the entire IT landscape remained a huge undertaking. Nobody was able to grasp it in its entirety or foresee all possible problems. A number of unforeseeable uncertainties popped up that none of the IT people had planned for or considered. Some major unforeseeable uncertainties were related to the large amount of legacy systems. About 60% of the systems were home-grown and custom developed.

> *FSF.DM2: "And then we have the technical issues and lot of software products that were custom to us. There was a debate whether we should bring those or if we should switch to a commercial product, and then we decided in the interest of time that we would stick with the custom solutions we had. But that became quite an effort to migrate that…."*

> *FSF.SM3: "… and unfortunately you cannot throw out all the proprietary or customized things that have been built over the last 20 years …"*

One of the major problems with the custom in-house development was the lack of documentation and, in some cases, even the lack of source code.

> *FSF.TL5: "System documentation was crucial for the application dis-integration, however most of our systems were only partly documented or had no documentation at all, so performing both the data as well as the replication of those systems became difficult because information about them about the systems was non-existing."*

FSF.SM1: "There was a huge effort to re-build some of the proprietary code…. There was also a lack of knowledge in house about some of the very old proprietary solutions."

Now, the division of the IT team into parent and carve out teams and the subsequent loss of knowledge really became a huge problem, as some of the proprietary systems the carve out team had to work with had no subject matter experts with regard to knowledge of old systems.

FSF.SM3: "We literally in the end had to bring that guy into our building and lock him in there with our guys, like for six weeks or something, so that he could train us on how this thing worked and we could rebuild it in the new data center."

There were also unforeseen problems where processes for copying systems and data had not been fully thought through.

FSF.DM3: "There were unforeseen problems when they reused the disc with the code on it to extract the data. We tried really hard to think of everything. I am a person who likes to plan, so I have thought through and through these practice runs in order to test the data extraction and transfer and reload, right…. There was a certain area on the share disc to place the extracted data on, and there was another part of it that had the programs for the conversion of the data, the extraction programs that everybody had been working on…. What we forgot was those discs were never backed up. They weren't part of the normal environment, they were added on to accommodate the switch and never put in the back up *cycle, and so on the second practice run weekend they prepped the discs and they wiped them clean and all the code was gone."*

Other obstacles were created by people who were not even aware of the problems they were causing for the physical IT dis-integration project.

FSF.SM3: "There were some challenges that we faced particularly on some of the changes that happened, even during the launch weekend. I came in early Sunday morning and the IT guys from the parent organization had changed the freaking daily processing jobs, the schedules had all changed, which now impacted our entire separation initiative. So we got all together, we had conference calls with the guys over there trying to figure out what had happened because when they change sequences of jobs like that it could have an impact on the reconciliation and things like that. So we had to get the accounting teams in to do reconciliation again. In the end we managed to complete the big bang launch as planned, after everybody pulled in."

Despite the unforeseeable problems the IT dis-integration team faced, they were able as a whole to pull it together, and the entire IT environment between the parent and the carve out became physically dis-integrated six months after the announcement of legal independence.

Completion of IT Dis-integration in Three Waves

The IT dis-integration initiative incorporated the IT infrastructure, which had to have capacity available in order to physically separate the financial and human resource systems in the beginning as well as the logical separation of all other systems.

FSF.DM1: "From an infrastructure perspective, we had to build all of this and get this in place, once that is in place then the application systems can compile and test their applications and execute their jobs. Without all of this infrastructure in place they can do nothing."

At the same time the IT infrastructure team provided set up of the new facilities that the carve out would move into. Area networks, phone systems, computers, printers, and any other IT infrastructure related to the transfer of employees had to be set up. Throughout all of those activities, the IT infrastructure team was also involved from the beginning in the physical IT dis-integration planning. A completely new IT infrastructure, including a new data center, all had to be put in place with clear timelines for availability of development environment, test environment, and production environment.

FSF.SM7: "[The] IT infrastructure team more or less runs the whole time in parallel. Because they were setting up the facilities, and they were in case of the physical separation of the financial systems we had new requirements, new boxes and things like that. And then even for the HR data migration there had to be some things in place to facilitate it. And then of cause the physical dis-integration required a complete new data center and IT infrastructure."

So the IT infrastructure team was involved throughout all of the demerger activities, from the first meeting of the CIO with his senior managers to the final launch of the physical dis-integration. However, the IT team alone could not complete a dis-integration of the IT landscape.

> *FSF.DM2: "They built the infrastructure, but remember the infrastructure is only part of it. Now you need applications, need data, and need schedules…."*

Given the scenario plan, the IT team had three stages of IT dis-integration more closely related to the application level. There was a logical separation, which related to applications still being operated jointly. However, access rights are distinct, and employees only had access to data relevant to their corporate entity. A much deeper separation was the physical dis-integration, where applications were separated and run on separate systems in independent infrastructures where no connection between the applications exists at all.

> *FSF.SM2: "So we knew conceptually that we had to separate the financial and human resource systems first logically than physically, and we knew we had to separate all systems first logically in order to make the early date for the completion of the demerger. However, given the demerger agreement we had to ultimately physically separate IT. All that was very clear and all this were wrapped in the notion that you had to continue to work and run the business as well."*

Due to the tight deadlines set out in the demerger negotiations that determined when the companies would announce the demerger, sign the demerger contract, and reach legal independence as well as reach complete independence between the two separating units, the IT team had to work in parallel on these various initiatives. There was no time for sequential work.

> *FSF.DM7: "This was also kind of happening in parallel; they were trying to get ready for the physical separation of financial and HR while trying to get the team together for the logical separation and trying to get the approach together for the physical IT dis-integration."*

> *FSF.DM8: "I was leading the logical separation of the systems, the initiative to for access segregation. However, I was also an application manager and had to manage my production systems and keep business running as well as got pulled into the physical separation of my applications."*

The intense overlap of activities within IT led to people trying to prioritize with regard to the nearest deadline and what work to focus on most.

> *FSF.DM2: "I met with every application manager and their team and kind of outlined how we envision the physical separation of the applications. However most IT people at that time were highly involved and challenged with the logical separation of the systems and were stating that they really cannot do much for this right now."*

In the end the various activities within IT that were required to dis-integrate the tightly integrated IT environment were completed in three major waves (see Figure 3).

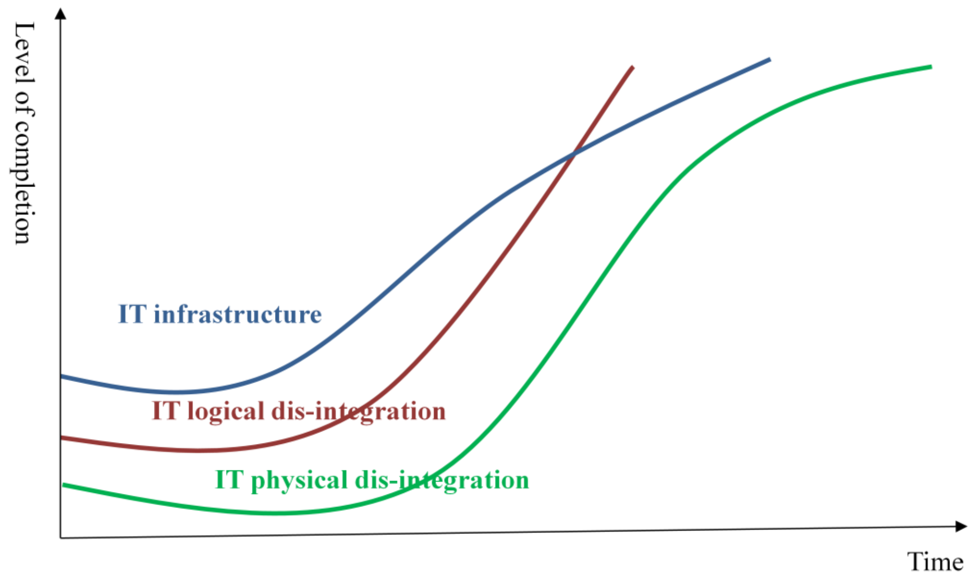


Figure 3: Three Waves of IT Dis-integration

The first wave was the completion of the logical separation of the systems, followed by the infrastructure team's completion of the new facilities as well as setting up the new IT infrastructure environment for development, test, and production. The final launch was the complete physical dis-integration of all systems and data between the carve out and parent organizations.

In order to manage the various activities to achieve IT dis-integration, the team applied common sense and their prior project management experience.

> *FSF.SM1: "We mostly did what made sense, so many of us have run big projects before, and we kind of knew what needed to be done [to manage complex IT projects like the dis-integration]."*

A project is often considered a collection of parallel and sequential activities which together produces an identifiable outcome of value (Pich, Loch, and DeMeyer

2002). In order to manage the overall IT dis-integration project, the IT management assigned sub-project teams to complete the logical separation of systems and data, the physical separation of financial and human resource systems, the infrastructure set-up for the new facilities, the creation of the new data center, and the complete physical dis-integration of all systems and data.

A Process Model of IT Dis-integration

Based on the demerger case study of the Financial Service Firm, this paper developed a process model of IT dis-integration. The following will introduce and discuss the model while considering relevant literature. Consistent with recommendations from prior research with regard to the development of process models (Langley 1999), the model describes the phases associated with a complex phenomenon of IT dis-integration, substantiates the characteristics of each phase including impediments, and articulates the triggering events that promote the movement from one phase to another. Consistent with guidelines for process models, the IT dis-integration model does not predict specific outcomes or timelines in which IT dis-integration will occur.

The process model of IT dis-integration (Figure 4) represents a sequence of three phases of an IT dis-integration in the context of a demerger with distinct initiatives and impediments. The transition triggers push the process to complete one phase and start the next. The antecedent condition precedes the first phase and considers the trigger that starts the process as well as some of its initial context conditions. An outcome is the final result following the completion of the third and final phase.

The antecedent of the IT dis-integration process model concerns the rationale for the IT dis-integration project. Most commonly it entails a corporate strategic decision to demerge parts of a company for various reasons. The decision to demerge parts of the business triggers the corporation's need to consider some level of IT dis-integration.

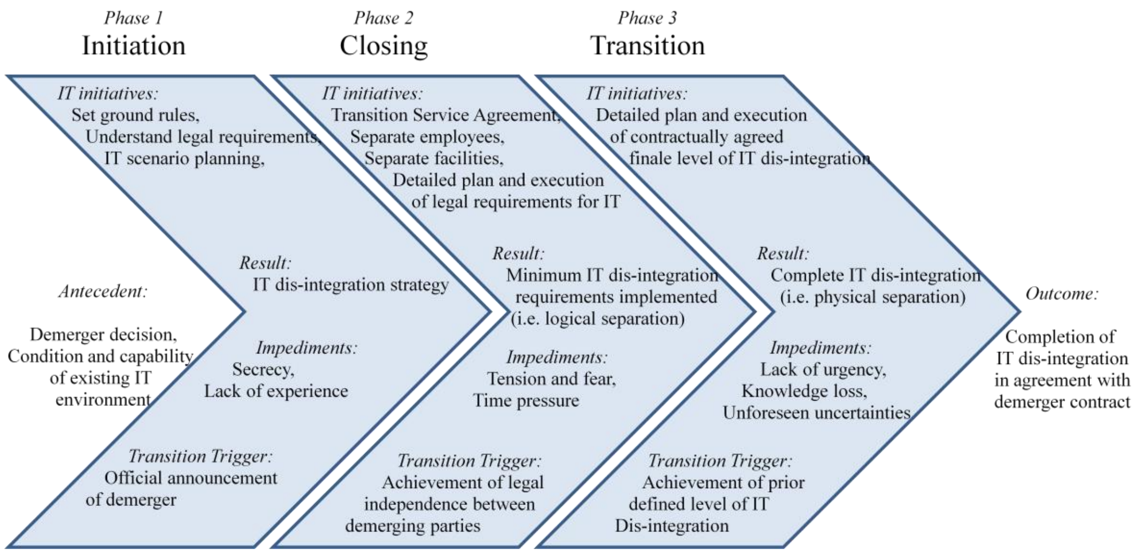


Figure 4: Process Model of IT Dis-integration

The *first phase* is an initiation in which ground rules are established for how the team will go about the IT dis-integration. During this phase IT professionals meet with legal advisors in order to understand what the demerger contract requires from IT with regard to the level of dis-integration. These requirements can entail any level of dis-integration of the IT resources (infrastructure/hardware, applications/systems/data, and people) and any combination of types of separation (logical and/or physical) as well as any temporal sequence (of course, logical separation would never occur after physical separation). In general the legal requirements with regard to the level of IT dis-integration will vary by demerger case.

Given their understanding of legal requirements, the IT team will start to develop various scenarios for how to go about IT dis-integration. The IT team will make a recommendation to the executive management team, which will ultimately decide what scenario the IT team will follow with regard to dis-integration of the IT environment. The entire first phase is challenged by a high level of secrecy. As the demerger has not been officially announced at this time, only a small group of IT employees will be involved. A further problem will be the lack of experience in the IT team for how to go about a demerger and, in specific, IT dis-integration. In most corporations, demergers are not necessarily an everyday task for the in-house IT organization and rather represent a non-routine situation. The official announcement of the demerger plans marks the end of the first phase and triggers the start of the second phase.

The *second phase* aims to reach a level of IT dis-integration that allows the closing of the demerger and operation of separate legal entities. Following the official announcement of the demerger plans, all employees in the IT area can be made aware of the need for dis-integration. Their expertise can be pulled in to the IT dis-integration initiative. During the second phase the management in IT will be required to make decisions with regard to splitting up the people in IT into who will be part of the IT organization within parent and who will go with the carve out. If the company has prior joint facilities, the IT people might also be required to support the set-up of new facilities as well as move to new locations. In addition the IT activities during this second phase mostly consist of detailed plans and the execution of IT dis-integration, which is required to close the demerger deal and establish/operate the separated companies as legally independent entities. Anecdotal evidence identifies that quite commonly IT dis-integrations can be lengthy initiatives; however, the parties will want to complete the legal part of the demerger as soon as possible after the announcement to the public, which puts time pressure on all related initiatives. The second phase will also be challenged by tension and fear among employees due to the announcement of the demerger, the change in the company, the personal impact of being placed with the parent or the carve out, the separation from prior colleagues, and potential re-location to new facilities. The final signing of the demerger contract, closing of the deal, and establishment/operations of separate legal entities marks the end of phase two and triggers the beginning of phase three.

Phase three considers the transition of IT separation from the interim level that was required to bring the demerger deal to a final stage. With completion of the legally required IT dis-integration level, not necessarily the contractually agreed to one, the final stage of IT dis-integration has been reached. In phase three the IT team will have to complete the IT transition and separation. During this phase the team has to expect challenges based on the lack of urgency for people outside of IT. Especially from a business point of view, the demerger is complete and the firms are operating as separate legal entities. The team may also face unforeseeable uncertainties during this time, mostly due to the high level of complexity of IT dis-integration as well as loss of knowledge in the IT team based on the division of the IT workforce between the demerged entities. Phase three should be completed with the final implementation of IT dis-integration in accordance with the demerger's contractual regulations.

Antecedent: Demerger Decision and Information Technology Environment

In general a strategic corporate decision to demerge a firm and to create two legally independent business entities causes the need for dis-integration of the existing IT environment.

However, one has to consider what type of IT environment the company operates prior to the demerger. Characteristics like the level of system integration, the level of architecture modularity, and the amount of legacy systems can have major implications for the IT dis-integration project. A tightly integrated environment will require a more complex approach than a modular setting where business units might already run on independent corporate platforms (Boehm et al. 2010). Prior research identified that in the case of tightly integrated IT environments, IT dis-integration projects are characterized by high complexity (Coury and Wilson 2009). The modularity of IT architecture, or "the degree to which an organization's IT portfolio is decomposed into relatively autonomous subsystems" (Tiwana and Konsynski 2009, 1), can foster a separation of the IT environment.

Also the existing IT capabilities of the firm prior to the demerger will affect the IT dis-integration process. Tanriverdi and Du (2009) suggested that superior IT capabilities within the company will positively impact the IT dis-integration initiative. Prior academic work considered capabilities as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece, Pisano, and Shuen 1997, 516). Firms with superior IT capabilities might have well documented IT processes, IT systems, and hardware environments. These existing documentations will enable the small team of experts in the beginning to identify quickly the IT portfolio that needs to be separated. With a well-defined IT process and landscape, dis-integration activities can be better planed and potential risks can be assessed early (Tanriverdi and Du 2009). The demerger decision itself creates the need for some type of IT dis-integration project. The existing conditions and capabilities of the IT environment influence the way IT will unravel its existing landscape.

With regard to IT dis-integration project approaches, one has to consider that project characteristics have an effect on project management's approach (Chiang and Mookerjee 2004). Academic research investigating antecedents to the success of projects suggests organizations should deliberately adopt more project-specific approaches to the management of projects; clear identification of a project's type prior to execution can provide insights for a better selection of managerial tools and methods (Shenhar and Dvir 1996). Specifically, Basili and Rombach (1988) determine that the overall IT project execution model (life cycle model), methods, and tools need to be altered or adapted for the specific project environment. As different types of projects are likely to require different management processes (MacCormack and Verganti 2003), the commonly known IT project management approaches within routine projects, such as Information Systems Development (ISD) or software maintenance, might not necessarily cover or correctly apply to the non-routine nature of an IT dis-integration. For example, in the current model the demerger decision initiates the first phase for investigating what is required with regard to the separation of IT between the parent and the carve out and how to proceed. However, the demerger context will not allow the IT dis-integration project to be run as a "normal" information system development project. As the process model identifies, initiatives like this have to consider a high level of secrecy and lack of experience in the beginning, and these conditions and challenges are not necessarily present in more routine types of IT projects.

Phase 1 – Initiation

In phase one a small team of IT managers will get deeply involved in the demerger negations. The team will also have to work closely with legal experts. Both, the demerger negotiation and the legal team will be major sources of information for IT managers about the level of IT dis-integration that will be required. From an initial point of view, this first phase seems to align with the more conventional IT projects with regard to the initial needs for identification and scenario planning. However, in contrast to the more common IT project approach that we know from information system development or enterprise resource planning implementation projects, the IT dis-integration project in the context of corporate demerger faces a layer of secrecy that has to be kept throughout the first phase.

Secrecy

Overall the first phase of a demerger is characterized by secrecy, as demerger negotiations will have just started. Only a very limited number of people are aware of the strategic decision and are involved in the first basic but far reaching decisions about how to disintegrate the business. Similarly, Hoare, and Cartwright (1997, 199) explained: "Like M&As, these types of change are also often cloaked in secrecy and the groundwork may be laid long before the announcement of the organization's intentions." Relatively little organizational management literature exists with regard to secrets in organizations and their impact on corporate initiatives or strategic projects. Keane (2008) identified that secrets in an organization can, on the one hand, legally protect it. This is the case during the first phase of demerger consideration. As the company has not yet publicly announced any demerger plans, the organizational members in tune with the strategic consideration are bound to secrecy, which might be enforced legally by the requirement that they sign non-disclosure agreements in order to protect the company against public knowledge. On the other hand, Keane (2008) identified that secrets in organizations might prevent the communication of knowledge. The prevention of the sharing of knowledge within an organization, which under "normal" circumstances is considered dysfunctional, is desired in this specific case and phase of the demerger. The corporation purposefully wants to prevent knowledge sharing about the demerger plans so it can prevent leakage of information to third parties. However, this type of secrecy goes both ways, as it also hinders the small team of IT experts' ability to reach out and incorporate the more detailed knowledge of other IT experts. Liebeskind (1997) found that when communication within a company is restricted, vital knowledge may not be passed in order to keep some information secret, as is the case in the early consideration of IT dis-integration plans. Another aspect of secrecy that needs to be considered during this first phase of demerger is the double-edged sword effect of secrecy. While it can create a kind of intimacy amongst the people on the "inside," it can also generate feelings of exclusion and distrust for people on the "outside" (Wexler 1987). Overall, the presence of secrecy can restrict IT dis-integration planning.

Proposition 1

The presence of secrecy during the first phase of IT dis-integration in the context of a corporate demerger is often quite purposeful in order to protect the company from leakage of non-public information. However, secrecy limits access to internal knowledge about the existing IT landscape and can reduce the accuracy of IT dis-integration plans.

Lack of experience

In the first phase of the demerger, the IT team, especially, faces impediments due to secrecy and uncertainty, which hinder their ability to disintegrate the information systems and allow the separation of businesses. Few corporations go through mergers, acquisitions, or demergers on a routine basis. Consequently, their activities are more structured toward the management of their ongoing businesses (Jemison and Sitkin 1986). In situations of major organizational change like a demerger, most managers are unfamiliar with what needs to happen in order to make it work. Thus, companies often rely heavily on external advisors whose interest may not coincide with those of the company and whose expertise concerns more the demerger negotiations than the separation of operations.

In the current case the CIO secretly put together a small group of people. The team consisted of the head of IT infrastructure, the head of applications, and the head of IT strategy and portfolio management. In addition, external advisors were recruited for their expertise in IT dis-integration. The base line for the considerations of the IT dis-integration was the contractual negotiations and agreement between the demerger partners on who owned the current IT environment. A key antecedent to the success of the IT dis-integration was that IT was involved in these negotiations and able to voice opinions about what would provide a “do-able” solution.

With regard to the specific IT dis-integration plan, the external advisors recommended a commonly used risk mitigating stepwise approach. The external advisors suggested a logical separation of the systems and data that would be followed by a complete physical separation; however, the physical separation would occur in steps. These steps would be based on application clusters, which would avoid the risk of a “big bang,” where all of the IT landscape would be physically separated at the same time. The CIO and his management team thought the stepwise physical separation of IT, as recommended by the external consultants, would not be do-able solution for their firm. First, within the Financial Service Firm the applications were so tightly interlinked that the in-house experts did not foresee any logical grouping or clustering of the existing systems. Second, every separation of a cluster would require the development of new temporary connections between the old and new environments. And third, the time frame was so extensive that the IT team feared they would never see the end of the project. Anecdotal evidence provides support for the fears of the IT management team. Some separations of IT environments, like those at Ford and Visteon, are multiyear projects (McGee 1999) while others are never completely separated, as in the case of 3M (Denton and De Cock 1997). In non-routine settings of a corporate demerger, in-house managers most commonly lack expertise on how to approach the required separation of IT. External advisors can provide ideas for general strategies that other companies have considered in the past. However, in-house managers need to consider the specifics of their own IT environment before making a call for the IT dis-integration plan to ensure linkage between business needs and IT plan (Tiwana, Bharadwaj, and Sambamurthy 2003).

Proposition 2

The lack of experience of how to go about non-routine initiatives like the dis-integration of entire IT environments in the context of demergers forces IT management to consider advice from external consultants. However, specifics of the corporate IT landscape can restrict general approaches to IT dis-integration. An organizational fit between the IT dis-integration strategy and the existing IT landscape has to be secured.

Phase 2 – Closing

After the official announcement of the demerger, the cloak of secrecy is lifted from the IT dis-integration project and the team will be able to include a wider range of IT experts in the dis-integration project during phase two. On the one hand, IT dis-integration projects will follow in some ways the common traditions of IT projects. The teams have to develop more detailed requirements and develop, test, and implement them. On the other hand, a number of IT initiatives that will be required in IT dis-integration projects will be less common, like the creation of Transition Service Agreements (TSAs) to regulate the IT services between the parent and the carve out following the close of the demerger agreement. In addition the IT management team has to plan for the separation of its workforce in two distinct IT teams and for the possible re-location of the carve out to a new facility.

Tension and fear

Similar to mergers and acquisitions, demergers are a major change to an organization that can fundamentally affect the well being of its individual members (Hoare and Cartwright 1997). The large-scale change and restructuring in a demerger engenders uncertainty and insecurity, which leads to stress amongst employees. Therefore, it is similar to a merger and acquisition environment. Owen and Harrison (1995) also identified that issues related to human resources are a potential risk during demergers. People feel stressed during demerger activities. As they perform their ongoing routine business, they also have to provide expertise and support for dis-integration activities. In addition to the workload-related stress comes emotional stress, the individuals' uncertainty about what the demerger will mean for them personally. Donaldson (1994, 36) states about the ICI demerger: "Of all the problems we anticipated, that of most concern was the potential loss of morale in staff throughout the company." The pinnacle of tension is reached when the people are informed about which future company they belong to, as they realize the loss of former team members, colleagues they have worked with, and the need to cut social ties. During a demerger, the dividing up of the workforce can create an emotionally difficult situation for all parties involved, invoking feelings of rejection and abandonment (Larson 2004).

Proposition 3

The presence of employees' emotional reactions to a demerger announcement and division of the workforce will overshadow the progress of IT dis-integration work.

Time pressure

With the announcement of demerger plans also comes the internal and external pressure to complete the demerger deal. Similar to a merger and acquisition announcement, following the demerger announcement, the demerger process can take a life of its own. It can become difficult to slow down once it is begun, especially once commitments made on the executive level become public knowledge as these put pressure on executive management to succeed (Jemison and Sitkin 1986). Prior demerger cases also often had ambitious schedules for the closing of the demerger deal and, consequently, a very short time frame between the announcement and the closing (Leimeister et al. 2008). As in the current case, quite commonly a logical separation of existing systems and data is used as an interim step to allow the fulfillment of the minimal legal requirements in order to create separate legal entities and close the demerger deal. However, based on the current case study's findings and prior research, most commonly the financial systems and human resource related systems might require a deeper layer of dis-integration prior to the signing of the demerger contract (Leimeister et al. 2008). A physical separation will provide a more secure dis-integration for those two mission critical systems in order to establish and operate separate legal entities.

Proposition 4

The forces that stimulate momentum in the demerger process are strong, creating time pressure for completion of IT dis-integration. IT management may choose an interim level of dis-integration in order to accommodate the timeline and allow closing of the demerger deal as well as operation of separate legal entities.

Phase 3 – Transition

With the signing of the demerger contract and the closing of the demerger deal, the company dissolved in separate legal entities. This triggers the beginning of phase three in the IT dis-integration project. From a business perspective, all separation has been completed; however, IT is lagging behind, as the physical separation still has to be done. Some corporations might have chosen a different form of IT dis-integration, allowing the parent to offer some type of IT outsourcing agreement to the carve out and consequently not requiring a complete physical dis-integration of IT. In that case phase three might not even be required. However, they may over time evolve into separate organizations, even if some of the systems of the parent company remain after the demerger (Hoare and Cartwright 1997). The other more unlikely consideration is that complete IT dis-integration has been achieved at the time of the closing of the demerger deal and legal separation. However, the level of prior IT integration as well as the level of complexity of the IT environment influence this. Prior case studies as well as the current case study lend support to the assertion that, most commonly, a third phase of IT dis-integration will be required following the closing of the demerger deal and legal independence of the entities (i.e., Leimeister et al. 2008; Faehling et al. 2009).

Lack of urgency

With the closing of the demerger deal and establishment of legally independent entities at the end of phase two, most employees assume that the demerger is completed. Considering the emotional rollercoaster posed by the potential for employees to find themselves in new positions and new organizational structures, most will want to get back to some kind of normality in their jobs. However, IT dis-integration is far from being completed. Most commonly, only the minimal legal requirements have been fulfilled by now with regard to IT separation, and the bulk of the hard work to separate the entire IT environment physically is still ahead of the team. As the IT dis-integration affects systems across the company, all business areas will need to be involved. Business areas will need to identify systems that the carve out does not need any longer that do not need to be brought into the new IT environment. People outside of IT will be required to test all systems as soon as they have been moved into the testing environment, and business people will be required to reconcile separated data to ensure they match the current data in the logical separate systems. So, as is common within IT projects, the IT dis-integration project can only succeed provided sufficient support from the business (i.e., Wallace, Keil, and Rai 2004). In the current case it took the force of the executive team to ensure everybody in the company made the IT dis-integration its number one priority until the company had achieved its complete independence. This is common within prior research, which identifies that success or failure of IT projects depends on executive support (i.e., Henderson 2006).

Proposition 5

The closing of the demerger deal and legal independence creates a sense of “being done” with the demerger and moving on to normal business. However, IT dis-integration most commonly will not be completed at this time and requires complete attention and priority within the company in order to succeed.

Knowledge loss

The separation of the workforce into parent and carve out will create a split in the existing knowledge base of the company. Owen and Harrison (1995) identified in the case of ICI’s demerger that the demerging sides both draw their management potential from the same pool, so they are required to hire from the outside in order to fill positions. But not only will the management level be affected. The common pool of subject matter experts in IT will also be split during the completion of the demerger, leaving two separate teams with partial lack of knowledge about specific systems or simply short on people to get the work done. This is especially true during the phase of IT dis-integration, and the carve out will need the knowledge of every existing IT system in order to review and possibly move it. Consequently, expertise coordination will be required to allow the IT dis-integration team to recognize where expertise and knowledge are needed, located, and accessed (Faraj and Xiao 2006). With regard to loss of knowledge and expertise, transitional service agreements have to be in place to allow for expertise coordination between the parent and carve out IT teams.

Proposition 6

The separation of the workforce during a demerger will create a lack of knowledge in both corporate entities. In order to allow for expertise coordination amongst the demerging partners, IT requires specific Transitional Service Agreements (TSAs) that provide access to existing expertise and knowledge.

Unforeseen uncertainties

As Lenfle and Loch (2010) identified, non-routine projects have to face unforeseeable uncertainties. In specific, the project members' lack of experience leads to situations that have not been anticipated at the outset. Similarly, when the need for IT dis-integration presents itself, most IT managers and in-house subject matter experts are unfamiliar with what will transpire. Most commonly, firms do not make demergers on a routine basis, so demergers and the required IT dis-integration present non-routine initiatives to the employees. McCormack and Verganti (2003) identified two sources of uncertainty that generate challenges for IT projects: platform uncertainty (reflecting the uncertainty generated by the amount of new design work that must be undertaken in a project) and market uncertainty (reflecting the uncertainty based on determining customer requirements). Nidumolu (1995) earlier termed two key types of uncertainties in IT development projects: requirements uncertainty and technological uncertainty. In order to limit the level of uncertainty, the IT team in the current case decided to freeze the existing systems, meaning they prohibited any changes or modifications to the systems during the IT dis-integration project. Freezing the IT environment or parts of it has been identified in prior research as a tactic for limiting uncertainties (Collyer 2009). Ultimately, the limitation of customer requirements (through the freezing of system change) and a clear objective (the complete physical dis-integration of the entire IT environment) limited the market or requirement uncertainty.

However, the platform or technological uncertainty remained, as it was unknown to the IT experts what problems would be encountered when the systems would only have portions of their prior data loaded and processed. So each system had to be reviewed. The code had to be checked to see if any routines required certain data sets and if these data sets were still available after the demerger. All systems had to be tested after altering required code and had to be tested with the reduced data of the carve out. The level of technological uncertainty can only be managed by sufficient planning and testing.

Nevertheless, both types of uncertainties can be categorized as foreseen uncertainties, and the IT team is at least partially aware of them at the outset of the physical dis-integration. However, the IT team also has to face unforeseen uncertainties, the kind of uncertainties that cannot be identified during project planning (DeMeyer, Loch, and Pich 2002).

In the current case, one major tool of the mainframe environment that managed all system changes was an in-house legacy system and mission critical for the operations of the IT infrastructure. The IT experts from the carve out only found out during the physical dis-integration phase that the source code for the tool was largely missing, as was the documentation. Quick solutions had to be found to bring a workable version of this mainframe tool to the new environment of the carve out. The IT team took un-bureaucratic steps by bringing one of the remaining subject matter experts to the carve out for several weeks and learning about the tool in order to re-create it. In other cases of unforeseen uncertainties, the team faced accidental deletion of code or non-communicated changes in mainframe job schedules. All unforeseen uncertainties had to be handled on a case-by-case basis with whatever solutions became available in order to manage the IT dis-integration.

Proposition 7

The non-routine setting of IT dis-integration in the context of demerger allows for partial mitigation of requirement uncertainty and technological uncertainties. However, IT teams face the need for situational reactions to unforeseen uncertainties.

Completion of IT Dis-integration in Waves

The current case identifies that IT dis-integration occurs on multiple layers/waves and not necessarily in clean, nicely packaged sequences of activities. The complete dis-integration of an entire IT environment first required the consideration of the IT infrastructure. The infrastructure team was responsible for setting up new facilities for the carve out as well as the planning and installation of new networks, data centers, and an entire IT infrastructure environment. The infrastructure team had to coordinate its activities and milestones with the other IT dis-integration projects. Those project teams were concerned with the application and system world. One project team was responsible for the achievement of the minimum legal requirements that would allow the closing of the demerger as well as the legal independence of the two separating entities. These minimal requirements included the logical separation of all systems and physical separation of the financial systems as well as the human resource related systems like payroll and benefits. The second application related project team was concerned with the completed physical dis-integration of the IT environment, and infrastructure became an integrated part of their milestone planning. Prior case studies of demerger and IT related activities also identified that infrastructure and application related requirements were treated in separate processes (Faehling et al. 2009).

Prior case studies related to IT dis-integration also found similar approaches. An IT dis-integration occurred in a logical followed by a physical separation in order to provide short-term IT solutions for the closing of the deal and to allow the necessary time for the completion of IT dis-integration (Leimeister et al. 2008).

The three layers of IT dis-integration (infrastructure, logical system dis-integration, and physical system dis-integration) were not run sequentially but in parallel. All three were an integral part of the IT dis-integration strategy; the ambitious time frame required all three to start at the same time, with various levels of resources. Infrastructure was required to work in parallel on the new facility set up as it was also required to plan for the new data center. Overall IT infrastructure initiatives were ongoing until the completion of IT dis-integration. The logical separation of systems and data was considered an interim step to fulfilling the minimum legal requirements to allow the parties to close the demerger deal and create separate legal entities. However, these legal requirements also included a certain level of physical separation. So the physical separation for specific systems was under the same time pressure as the logical separation. In addition, the physical separation team worked from the beginning on scenarios and requirements for how to accomplish the complete physical separation of systems and data.

Proposition 8

IT dis-integration needs to be considered as a multi-layered project that consists most commonly of infrastructure dis-integration, logical system dis-integration, and *physical system dis-integration. However, the layers will not run or be completed in sequence but rather in parallel.*

Discussion

This study provides a fresh conceptualization of an IT dis-integration process model in the context of a corporate demerger. As noted previously, little is known about the operations of demerger and, in specific, about IT dis-integration. A handful of studies have considered IT dis-integration in the context of demerger with regard to transitional service level agreements (Tanriverdi and Du 2009; Du and Tanriverdi 2010), identification of success factors (Leimeister et al. 2008), or analysis of strategic and organizational challenges (Faehling et al. 2009; Boehm et al. 2010). The findings of those papers apply to the developed process model of this study, confirming the findings of the current in-depth case study and lending additional validation to the model and impediment-related propositions.

The process model of IT dis-integration provides a generic frame with regard to antecedents and major events that lead to a prior defined level of IT dis-integration. The IT dis-integration caused by a demerger decision can take multiple forms depending on the structure of the IT environment prior to demerger, IT capabilities, and the objectives of the demerger partners. Consequently the IT dis-integration process model developed here can be considered in multiple ways.

In some demergers, companies might not even aim for complete IT dis-integration and rather settle on an IT service agreement between carve out and parent company, allowing for a type of IT service outsourcing. As was the case with Unilever and the separation of its service centers, some firms can sign IT outsourcing agreements (Insights 2012). In those cases only phases one and two of the IT dis-integration process will be required, leading to rather limited requirements with regard to infrastructure and leaving most of the systems-related issues with an outsourcing partner.

In other demergers, the parent might be planning and preparing for the separation of specific entities ahead of time, allowing the firm to create separate IT environments (infrastructure and systems) even before any official announcement. This was the case with Ford and Visteon's demerger, where, over a year prior to demerger announcement, IT was already working on the creation of separate IT landscapes (McGee 1999). In these types of demergers, complete IT independence can potentially, but not necessarily, be achieved at the same time as legal independence, completing phase three at the same time as phase two.

There is also anecdotal evidence of firms that aimed to reach a complete IT independence; however, the process of physical IT dis-integration might be very lengthy. In the case of 3M, prior research implies that despite major efforts in the IT area, they could not create a complete split of the IT environment and continued to operate some systems jointly (Denton and De Cock 1997). The current process model might still be applicable in cases like this; however, phase three might not have a clearly defined end date.

Overall, firms have a choice whether to achieve only legal independence and continue running the carve out on the IT environment of the parent in a type of outsourcing agreement or to move into phase 3 and create a completely independent carve out with a completely separate IT environment. However, these decisions of whether or not to enter phase three have to be made early on in the scenario planning of the IT separation strategy. A complete physical separation of IT requires the set up of a completely new infrastructure environment, and that requires a significant amount of time and effort.

In addition to the development of an IT dis-integration process model, this paper provided first insights of impediments related to the dis-integration process. During the first phase, secrecy and lack of experience were the most dominant impediments, carrying their own sort of risk for the development of an IT dis-integration strategy. Specifically during phase two, tension and fear among employees as well as the severe time pressure were challenges to the success of reaching legal independence amongst the demerging parties. Finally, complete IT independence in phase three was challenged by the lack of urgency, especially amongst non-IT related areas, as well as knowledge loss within IT and unforeseen uncertainties.

Implications

The current paper provides a conceptualization of IT dis-integration in the context of demerger and complements the existing narrow stream of demerger research by introducing a process model and phase-specific impediments. Both have implications for research and practice.

From a practitioner’s perspective, the current paper provides the first uncomplicated model for senior IT managers to gain a high-level understanding of how the dis-integration of their IT environment can unfold over time. The paper offers them a sequence of major events that can be considered a basic blueprint for understanding what will be required to create two completely independent IT environments. Looking more closely at the individual phases of the model, IT senior management ought to be involved early on in order for them to influence contractual agreements related to the split of IT. IT managers need to be aware of the forthcoming demerger in order to allow them sufficient time to plan for the separation of the IT environment; here, time will be of essence. They need to reach out to demerger experts and legal and external advisors in order to understand requirements and options. Doing so will help IT managers make strategic choices that offer a high level of organizational fit between the demerger strategy and the existing IT environment and capabilities. IT managers need to be prepared for the challenges related to people's emotional reactions to the demerger and the splitting up of the teams. But IT management also needs to be aware that when the demerger deal is done, the major work might just be beginning, and they will only succeed with the support from the business, knowledge coordination between the demerging parties, and un-bureaucratic solutions to unforeseeable uncertainties.

Anecdotal evidence confirms that a number of demergers never see the complete dis-integration of IT, even when the demerging parties aimed for it. Creating awareness of impediments in the process of IT dis-integration can also help executives and managers in IT to better prepare for the phases of separation.

The research contribution is in the development of a grounded IT dis-integration process model in the context of corporate demerger that enriches our academic understanding of how this complex phenomenon unfolds over time. Many insights emerge from this study. First, the model highlights the IT dis-integration as a gradual process. The complete separation of an entire IT environment does not occur overnight; it is created step by step, sometimes reaching interim solutions before the final level of IT separation can be achieved.

Second, in order to understand the process well, one needs to closely examine the antecedents of the IT dis-integration process. The characteristics of the existing IT environment affect the way IT dis-integration can unfold. Highly modularized architecture might not require interim solutions, as complete IT dis-integration can be reached swiftly. However, more research is needed on the impact of specific antecedents of the IT dis-integration process.

While it might be tempting to simplify the IT dis-integration process as infrastructure separation, or logical and physical systems separation, the findings of the case study suggest that those sub-processes run in parallel with different timelines for completion. However, the levels of completion do not necessarily align with the IT dis-integration phases.

Limitations and Future Research

This research is focused on the development of a process model that explains how and why the process of IT dis-integration unfolded. Given its nature, the study of process models does not allow for the identification and development of a hypothesis or a hypothesis test of variables that affect the level of outcome. A follow-up study might be interested in asking specific questions about what factors affect the success of IT dis-integration. For example, does the degree of top management or expert involvement affect success? Do antecedent conditions of the common information technology environment prior to the demerger, like the existence of a common ERP or level of IT architecture modularity have any impact on the outcome (Tiwana and Konsynski 2009).

Clearly, future research can build upon the findings of this study by examining additional IT dis-integration projects and trying to develop constructs that affect the successful outcome of IT dis-integration projects and allow the use of quantitative measures to test hypothesized relations amongst the constructs.

With regard to the limited generalizability of single case studies, an extension of the current process model to explore the IT dis-integration process at other demerger sites can provide further insights and confirmation of the process model for IT dis-integration. In addition, more case studies will allow a cross-case analysis and increase the validity of the model.

Conclusion

Given the number of corporate demerges in contemporary organizations and the limited academic work related to IT dis-integration in the context of demerger, there is value in understanding the phases and events that characterize IT dis-integration. This study represents a contribution to research because it articulates a model that sheds further light on the process by which IT dis-integrates its resources (hardware, systems, and people). The current process model suggests that IT dis-integration consists of three phases: initiation, closing, and transition. Each phase of the model contains within-phase IT initiatives and impediments that can challenge the completion of initiatives and events and reach of phase specific results. The phase-related impediments are secrecy and lack of experience during the initiation phase; tension and fear; time pressure during the closing phase; and lack of urgency, knowledge loss, and unforeseen uncertainties during the transition phase. The model reveals that IT dis-integration is not the result of one single IT initiative but rather the combination of a complex network of multiple IT projects (infrastructure separation as well as logical and physical systems separation) that reach completion at different points in time in conjunction with the overall demerger timeline.

A Computational Modeling Approach to Understanding the Dynamics of Knowledge Gain in Technology Acquisitions

Introduction

As information technology firms can be characterized by the newness and complexity of technological products, as well as rapid innovation, for many firms the pace and magnitude of technological change and the subsequent depreciation of knowledge may not allow them to develop internally all the technical knowledge and capabilities they need to remain competitive (Chaudhuri and Tabrizi 1999). John Chambers, Cisco's president, stated, "If you don't have the resources to develop a component or product within six months, you must buy what you need or miss the opportunity" (Bower 2001, 99). Amongst technology companies it has become commonplace to obtain and increase technological knowledge and capabilities through the acquisition of particular firms and thereby fast-forward new product development (Graebner, Eisenhardt, and Roundy 2010). In fact, the trend of obtaining external technologies via firm acquisition seems to continue strong, as BDO's 2012 survey of technology firms explains: "M&A [Merger and Acquisitions] remains an attractive opportunity. The fiercely competitive environment is pushing companies to aggressively target the best and brightest technologies. Among middle-market tech companies, there's an acquire or be acquired mentality" (Harris 2012, 1). Overall, knowledge becomes the primary motive of technology acquisitions as it provides opportunities to increase the acquiring firm's level of relevant knowledge and accelerates the likelihood of innovation (Makri, Hitt, and Lane 2010).

Prior research in technology acquisitions has considered the impact of acquisitions on acquiring firms' innovative performance (i.e. Ahuja and Katila 2001; Cassiman et al. 2005; Prabhu, Chandy, and Ellis 2005) as well as the acquiring firm's market value (i.e. Benou and Madura 2005; Ragozzino 2006). Scholars, who have studied the performance of technology acquisitions have also considered a variety of factors such as the type of knowledge to be transferred (i.e. Bresman, Birkinshaw, and Nobel 1999, 2010), the retention of employees from acquired firms (i.e. Ranft and Lord 2000), and the post-acquisition integration process (i.e. Puranam, Singh, and Zollo 2006; Puranam and Srikanth 2007). However, few, if any, academic studies have attempted to measure the post-acquisition performance of technology acquisitions via a company's proximate motive: to increase the acquiring firm's relevant knowledge level.

Knowledge gained from an acquisition can be categorized as either codified and easily articulated knowledge or individual-level knowledge held by those who have worked together in the context of the acquired firm. Easily articulated knowledge can be transferred or copied from third parties lacking a sustained competitive advantage (Barney 1991). However, individual-level knowledge refers to beliefs, experience, concrete know-how, and skills, which serve as important and unique resources that can be tapped in the service of performance (Nonaka 1994).

The majority of papers with regard to knowledge gain in technology acquisitions anticipate that knowledge-carrying employees are the primary source of competitive value (Ranft and Lord 2000). Retention of employees from acquired firms is assumed to provide a mechanism for transferring and integrating individual-level knowledge to acquiring firms (Ranft and Lord 2002). To increase the knowledge level of the firm (i.e., to improve the quality of knowledge leading to improved firm performance), knowledge-carrying employees from the acquired firm are integrated into the acquiring firm's process of inter-organizational learning. However, prior academic work has given limited consideration to whether the desired outcome of an improved knowledge level has been achieved through retention of employees from acquired firms. The present study aims to fill that gap by studying the two primary questions:

- Does the level of knowledge of the acquiring firm increase due to the retention of employees from the acquired firm?
- Does variation in retention strategy affect the knowledge gain of the acquiring firm?

As it is difficult to observe specific technology acquisitions with multiple retention strategies and the many factors that commonly influence a firm's level of knowledge, the current paper applies a computational simulation. In specific, the methodology employed is a strategic modification of March's (1991) simulation model of organizational learning. In particular, the new model (referred to as KAM, the Knowledge Acquisition Model) was adapted to describe an acquisition scenario. The model allows the manipulation of retention levels of employees from the acquired firm, and it also allows the exploration and exploitation process of organizational learning to integrate the employees' knowledge into the overall knowledge base of the acquiring firm. The results of the model allow us to develop propositions about the effects of retaining employees from acquired firms on the knowledge level of the acquiring firm. In particular, the results from the simulation model shed light on the retention strategies for acquiring firms identifying that not all retention strategies lead to the same level of knowledge increase.

This research makes several contributions to the study of technology acquisitions. First, it suggests that technology acquisitions can specifically contribute to an improvement of the acquiring firm’s knowledge base if employees from acquired firms are retained. Thus, this confirms much of the received, albeit informal, wisdom in the field. Second, it introduces a particular non-linear relationship between the strategy of retention of employees from acquired firms and the improvement of acquiring firms’ knowledge. Finally, the research explicates the importance of retaining the “right” employees from the acquired firm, as the largest increase of acquiring firms’ knowledge occurs with the retention of the first forty percent of employees from acquired firms, suggesting an expected decrease in marginal utility.

In the following three related research streams are discussed: the knowledge-view of the firm, organizational learning, and technology acquisitions. These provide insights for the specification of a technology acquisition model. Second, the simulation model, its extension, and the method are described. Third, the results are presented, which leads to the development of propositions. The final section describes the discussion and conclusion of the work, highlighting the implications of the findings for both practice and subsequent research.

Theory

Knowledge

For the purpose of answering the research questions, a primary task is to establish those key characteristics of knowledge held by individuals that have critical implications for acquisitions, especially in the context of information technology firms where groups of individuals have successfully worked together. One has to begin with the knowledge of people or of the individual human being and consider that groups of people interacting with each other can generate unique patterns of successful behaviors within an organization that are difficult to identify or replicate, without great difficulty or cost, if at all (Badaracco 1991). Knowledge held on the level of the individual tends to be more internal and routine. It includes habits, situational insights, and intuitions that dynamically adjust the routines as well as underlying perspectives, beliefs, and attitudes that are not typically reviewed or communicated. Consequently, it is often difficult to identify and explicate the details of this knowledge when necessary and, therefore, hard to share (Becerra-Fernandez and Sabherwal 2001). Specifically, individuals who are knowledgeable are also able to integrate and frame their knowledge within the context of their experience and expertise and by this create new knowledge (Grover and Davenport 2001).

From a fundamental point of view, knowledge relevant to organizations originates (directly and indirectly) from people, as it is within people that knowledge exists and is created (Nonaka 1994; Grover and Davenport 2001). An organization cannot create knowledge without individuals; however, an organization can support individuals and provide them with an environment in which to create knowledge (Nonaka 1994). Consequently, Nonaka identified (metaphorically) that organizational knowledge creation is a process that supports the knowledge creation of individuals. Informal as well as formal social interactions within an organization foster knowledge creation amongst individuals.

In a similar fashion, Grant (1996) identified the organization as an institution that integrates the knowledge of its individual members. He also adopts the view that knowledge resides within the individual. However, from Grant's point of view, an organization does not create knowledge but rather only applies and integrates the knowledge of its individuals. In a similar fashion, Felin and Hesterly (2007) concluded in their work that organizations only learn based on their individuals, and, as such, value can only be created on the individual level. There exists, however, a critical debate about whether the individual or the collective, here in form of the organization, can be the source of knowledge.

Other researchers considered that more than just individuals exist within organizations as knowledge repositories. Leonard (1995) postulated that an organization owns a number of knowledge assets, in specific individual-level knowledge and skills, physical systems such as software or machinery, management systems that create the channels through which knowledge is accessed, and the norms that support knowledge creation. Also, Walsh and Ungson (1991) posited that there are a variety of knowledge repositories within an organization: (a) the individual employees, (b) the roles and structures of the organization, (c) the standard operating procedures of the organization, (d) the culture of the organization, and (e) the physical structure of the workplace.

In a similar fashion Kogut and Zander (1992) identified that knowledge is not only held by individuals, it is also expressed in procedures and in how employees of an organization cooperate. As such, the authors identified that knowledge is embedded in the organization's principals, through which its members interact with each other. Thus, knowledge of an organization is created by combining an employee's distinct individuality and personal knowledge within a specific set of activities in combination with other employees (Leonard 1995). Similarly, March (1991) considered that organizations store knowledge within their norms, rules, and procedures. Consequently, firms can accumulate their knowledge over time and learn from their individual employees. At the same time individual employees, through informal and formal social interactions, will learn from the organization (March 1991) as well as from one another (Nonaka 1994). The overall organizational knowledge base emerges out of the social interaction of individual employees (Koskinen and Vanharanta 2002). Similarly, Cross and Baird state, "An organization's memory resides in the minds of its employees and in the relationship that employees tap on an ongoing basis to accomplish their work" (Cross and Baird 2000, 70).

Organizational Learning

The concept of knowledge is central to the research stream of organizational learning. March and Simon (1958) as well as Levitt and March (1988) concluded that organizations accumulate knowledge beyond that which is embodied in individuals through organizational learning. Knowledge has to be considered a multi-level concept, residing within individuals as well as on an organizational level.

Organizational learning theories provide an understanding of the processes within firms that generate and utilize organizational knowledge. Organizational learning uses existing knowledge within firms on individual and organizational levels and incorporates new knowledge (Liu 2006). The overall process leads to an increase in the knowledge level of the organization.

According to March (1991) two main modes of organizational learning have to be considered, and both affect what kind of knowledge is produced as well as different inclinations. First, exploitation is considered to be the use and further refinement of existing knowledge (March 1991). Sitkin et al. (1994) identified exploitation as a learning activity that involves the use of the resources an organization already has. Within this process the organization gains knowledge by applying current or existing knowledge (Liu and Fehling 2006). Knowledge that has already been created and internalized has to be retrieved (Lyles and Schwenk 1992) and will be refined within existing processes. Second, exploration refers to the gaining of new knowledge through such processes as experiments or innovation (March 1991). Sitkin (1994) referred to it as learning activities that lead to the addition of new resources. Exploration indicates an organization's ability to acquire new knowledge as well as to innovate (Liu 2006).

In order to increase its knowledge, an organization has to allow for mutual learning among individual employees and for the accumulated knowledge of the organization (March 1991). However, the concept of organizational learning not only applies within the boundaries of a firm but also offers a pattern for knowledge creation across firm boundaries, so-called inter-organizational learning (Holmqvist 2003). The research stream of inter-organizational learning recognizes that collaboration amongst individuals that facilitates learning and knowledge creation is not only possible amongst the employees of one firm but also amongst employees of collaborating firms (Lavie and Rosenkopf 2006). In this context organizational learning offers the possibility of accessing or acquiring new knowledge (Mowery, Oxley, and Silverman 1996). The movement of knowledge across individual and organizational boundaries is ultimately dependent on employees' knowledge sharing behavior (Bock, Zmud, and Kim 2005). Knowledge sharing and learning occur for the most part within human interactions, which are the primary source of knowledge creation (Argote and Ingram 2000).

Prior research into inter-organizational learning has focused on two major forms of inter-firm collaboration. One stream of research describes firm alliances and the implications for organizational learning (e.g., Larsson et al. 1998; Lavie and Rosenkopf 2006). Alliance partners can be considered as external sources of knowledge (Awazu 2006). Organizations can learn from their alliance partners, and this learning can improve their competitive abilities (Norman 2004). However, Mowery et al. (1996) identify that significant inter-firm knowledge transfer and learning only occur in a subset of alliances and are related to the structure and content of alliances arrangements. As organizations control their internal resources, activities, and behavior, it allows them to manage their organizational knowledge. However, external sources of knowledge are, by definition, located outside the firm's boundaries, and in alliances the organization has, as such, limited control over the behavior, actions, and motivation of external sources of knowledge (Awazu 2006). The legal framework of the alliance arrangement can offer some level of control over the knowledge that partners aim to share and learn from.

A second stream of inter-organizational learning considers acquisitions and how they may broaden a firm's knowledge base (e.g., Vermeulen and Barkema 2001; Zollo and Singh 2004). Not surprisingly, gaining and improving knowledge has been commonly cited as a key reason for acquisitions (Bresman, Birkinshaw, and Nobel 1999, 2010), especially since the speed of competition in many industries seems to require short-term expansion of firms' knowledge in order for them to develop new products (Hedlund 1994). Most of the knowledge that organizations aim to acquire is embedded in individual members of the acquired organization (Argote and Ingram 2000). The individuals are able to transfer their knowledge as they move and adapt it to the new context (Argote and Ingram 2000). However, their knowledge transfer is contingent upon social interactions with members of the acquiring firm. Knowledge transfer is contingent on a successful integration of the acquired organization (Haspeslagh and Jemison 1991). Bresman et al. (1999) argued that individuals from acquired firms will only participate willingly in knowledge exchange and creation once they experience a sense of identity and belonging with their new colleagues; as such, knowledge creation between acquiring and acquired organizations will only emerge with the development of a cooperative relationship. The empirical study of mergers and acquisitions by Casal et al. (2007) identified that the knowledge base of acquiring firms as well as the frequency of rich communication between acquiring and acquired firms has a positive influence on knowledge transfer.

Technology Acquisitions

As competition becomes increasingly knowledge-based, firms face the problem of developing required knowledge in a timely manner internally (Hagedoorn and Dysters

2002). In high-velocity environments (Brown and Eisenhardt 1997) like the information technology industry, a firm's survival depends on its ability to produce multiple product innovations in quick succession. In addition, the complexity and speed of technological change often leaves companies lacking the required knowledge to produce innovations (Wadhwa and Kotha 2006).

In order to gain required knowledge, firms turn towards external sources to increase their knowledge (Capron and Mitchell 2009). Mergers and acquisitions can be seen as a means of accessing these key resources and allowing a firm to complete and renew its own organizational knowledge. Dominant among these knowledge sourcing strategies is the so-called technology acquisition: the acquisition of small technology-based firms by large, established firms (Granstrand and Sjölander 1990; Puranam, Singh, and Chaudhuri 2009). "Technology has become so sophisticated, broad, and expensive that even the largest companies can't afford to do it all themselves," writes Robert Z. Gussin, Former VP of Science and Technology at Johnson&Johnson (Leonard 1995, 135).

Prior research has studied technology acquisitions with regard to post-acquisition performance and integration level. In order to access acquired knowledge and commercialize it, the acquiring firm needs to integrate the acquired firm; however, the autonomy of the acquired firm should be maintained to allow for continued innovation (Puranam, Singh, and Zollo 2006). The authors measured post-acquisition performance by the increase in innovative outcome. Puranam et al. (2006) considered the absolute number of new products introduced by the acquiring firm since the date of acquisition as the innovative outcome. In another study, Puranam and Srikanth (2007) considered the “coordination-autonomy dilemma,” the question of whether to integrate or keep an acquired firm independent. They identified that the answer varies based on whether the acquiring firm wants to gain access to what the acquired firm already knows or rather wants the acquired firm to continue its innovative work. In this paper the authors measured post-acquisition success by counting acquiring firms’ new patents that cited acquired firms’ prior patents. In a further follow up study, Puranam et al. (2009) identified that preexisting common knowledge amongst acquired and acquiring firms might reduce the need for integration and offer more autonomy for the acquired firm. In this paper the authors used the level of post-acquisition integration as the dependent variable and did not measure post-acquisition performance per se. With regard to the question of integration versus autonomy, a study by Schweizer (2005) provided insights from a variety of case studies. This study identified that the acquiring firm will choose multiple levels of integration. A single categorization of either integration or autonomy cannot, in the author’s terms, capture the full complexity of post-acquisition implementation and integration.

Another research stream analyzed post-acquisition performance in connection with the retention of acquired managers. Graebner (2004) identified that the managers of an acquired firm have a key role in the post-acquisition integration phase. The author identified that the retention of acquired managers allows the acquired firm to preserve its performance. Placing acquired managers in cross-functional roles can allow them to locate prior unidentified synergies and knowledge. The author based her analysis and measurement of post-acquisition performance on in-depth case studies and qualitative data from interviews.

Scholars have also considered the impact of knowledge relatedness between acquiring and acquired organizations on post-acquisition performance. Ahuja and Katila (2001) found that the size of the acquired knowledge base enhanced the innovation performance of the acquiring firm; however, the relatedness of the acquired and the acquiring firms' knowledge bases had a nonlinear impact on the innovation output of the acquiring firm. The authors identified the innovative output of an acquiring firm through its patent count four years following an acquisition. Similarly, Makri et al. (2010) found that complementary knowledge between the acquired and the acquiring firms contributes to a more innovative performance for the acquiring firm. The authors measured innovative performance based on an increase in acquiring firms' absolute patent count as well as the extent to which acquiring firms' patents were cited three years after acquisition.

Many scholars have recognized that, in order to gain acquired knowledge in technology acquisitions, one has to consider that most of the knowledge resides within the employees from acquired firms. John Chambers, president of Cisco, once stated, "Most people forget that in high-tech acquisitions, you really are acquiring only people" (Byrne 1998, 102). Similarly, Chaudhuri and Tabrizi (1999) considered the knowledge view of the firm and identified that technological knowledge in high tech firms is tied to skilled people. They are the knowledge assets that one aims to acquire in technology acquisitions. Consequently, these knowledge carriers need to be integrated carefully to ensure that they remain with the acquiring firm and continue their work to the best of their ability (Birkinshaw 1999).

Scholars have applied the theory of knowledge and organizational learning concepts to discuss M&A performance and, in general, identified a positive relationship between post-acquisition performance and knowledge transfer (Ahuja and Katila 2001). Ranft and Lord (2000) identified that acquired technological knowledge is, to a large degree, embedded in individual-level knowledge and the social interactions amongst employees from acquired firms. In order for the acquiring firm to gain access to this knowledge, retention of employees from acquired firms is of central importance to the overall success of a technology acquisition. The authors measured post-acquisition success based on the level of acquired employee retention according to survey data. In the succeeding study, which was based on seven in-depth case studies, Ranft and Lord (2002) identified that the ultimate motive of technology acquisitions, the transfer of technological knowledge, is based on the individual-level knowledge and personal interaction of the employees from acquired firms as well as the speed, communication, autonomy, and retention level of the acquisition implementation.

One of the main motives of technology acquisitions is to gain knowledge, knowledge that is embedded in individuals and the social interactions of the acquired organization (Graebner, Eisenhardt, and Roundy 2010). The acquired knowledge will only be available to the acquiring firm if the employees from the acquired firms are retained (Ranft 2006). Managers of the acquiring firm not only have to enable their firm to exploit existing knowledge within but also explore newly acquired knowledge, especially the individual knowledge of retained employees from acquired firm. The process of socialization and, more specifically, organizational learning allows the integration of acquired knowledge, especially individual-level knowledge (March 1991; Vermeulen and Barkema 2001).

Moving individual employees has been identified as a powerful mechanism to facilitate knowledge transfer within and across organizations (Argote and Ingram 2000), especially as individuals are able to transfer both types of knowledge when they move and adapt it to new contexts. In their empirical study of the mobility of engineers in the semiconductor industry, Almeida and Kogut (1999) found that moving individual employees transferred knowledge about innovations across organizational boundaries. From prior literature one can infer that the retention and integration of employees from the acquired firm into an acquiring firm should improve its knowledge.

To investigate the relationship between the retention of employees from the acquired firm and the organizational knowledge of an acquired firm, this paper applies and extends March's model of organizational learning in the context of technology acquisitions.

Model

Computational modeling is a growing research method in the social sciences that refers in general to the use of models that are described in a set of computer codes (Carley 2008). Because the researcher has complete control over his research environment in the computational models, they are often considered "virtual experiments" (Prietula, Carley, and Gasser 1998). Computational models allow the researcher to run virtual experiments without changing the actual world; however, the models allow him to predict, understand, and analyze complex systems (Carley 2002). As

Harrison et al. stated, "Simulation modeling provides a powerful methodology for advancing theory and research on complex behaviors and systems" (Harrison et al. 2007, 1229). Organizations are large complex and highly volatile systems, and often individuals can affect how these systems work (Prietula, Carley, and Gasser 1998). Simulation modeling can uncover interactions amongst multiple organizational elements and explain how they unfold over time (Repenning 2002). In a model the researcher can focus on constructs that are often difficult to observe (Kane and Alavi 2007). However, one has to accept that simulation modeling is a theoretical abstraction of the real-world organization that relies on simplification, which creates the on-going question of how close a model has to be to "reality" in order to be relevant (Burton and Obel 1995).

In order to explore the effect of retaining employees from an acquired firm and of integrating their individual knowledge into the organizational learning process of an acquiring firm, the current study replicates and extends the computational model of organizational learning from March (1991). This procedure follows the recommendation that building on existing computational models instead of developing completely new ones presents an effective way to validate existing models (Kane and Alavi 2007). It also allows for a cumulative research tradition and offers more extensive explanations of constructs, interrelations, and ideas than the development of a completely new model (Prietula and Watson 2000).

March's Model of Organizational Learning

March (1991) developed a model of organizational learning. The model considers an external reality, individual knowledge about that external reality, and an organizational knowledge or code representing an approximation of the external reality derived from a group of individuals' shared knowledge. March defines individual knowledge level as the proportion of external reality correctly represented by an individual knowledge vector. Also, the proportion of reality that is correctly represented by the organizational code defines the organizational knowledge level. Both individual and organizational knowledge levels potentially interact and change via organizational learning.

Following the prior discussion of knowledge, March (1991) and later Nonaka (1994) suggested that knowledge is viewed as either individual or collective. For each iteration of March's model, every individual has the potential to change any beliefs to conform to the corresponding knowledge of the organization, and this represents the level of exploitation of existing knowledge. This approximation of exploitative learning serves to model individual learning on organizational knowledge. Similarly, for each iteration the organizational knowledge or code has the possibility of altering any beliefs to match the dominant knowledge of expert individuals. This represents the process of an organization exploring new knowledge and refers to that exploration. The approximation of explorative behavior serves to model organizational learning from individuals. Improvement in individual and organizational knowledge levels comes either from organizational knowledge adapting to the knowledge of individuals or from individuals conforming to the knowledge of the organization.

March (1991) conducted two models, one in a closed system having fixed organizational members and a stable reality and a second one in a more open system that included possible turnover in employees and a changing reality.

The closed model (March 1991) contains the following four main features:

(1) There exists an external reality, which is unknown. The external reality exists of m dimensions, with m greater than zero and each with a value of 1 or -1 in equal probability.

(2) There exist multiple time periods; in each of them the belief about reality is held by n individuals as well as within an organizational code. Each of the m dimensions can be represented as 1, 0, or -1 within an individual's and an organization's code belief about reality. In specific, 0 represents the absence of a belief about a specific dimension.

(3) The existing n individuals are members of an organization and, as such, learn on a permanent basis from the organization. This leads to an ongoing change in the individuals' beliefs about the m dimensions of reality. In each time period, individuals learn with a probability p_1 from the organizational code.

(4) The existing organizational code is, in return, affected by the n individuals' beliefs. In specific, when the individual beliefs correspond more closely to the dimensions of reality than the organizational code, the organization can learn and change its code with a probability of p_2.

The level of exploitation within the organization is reflected through p_1, the rate of socialization or the degree by which individuals learn from the organizational code.

Exploration is represented by p_2, the rate by which organizational code is changed through individual beliefs.

As such, knowledge depends on the level of similarity between beliefs (individual and organizational) and the external reality. Improvement in knowledge comes through multiple time periods as the organizational code copies the beliefs of superior individuals and as individual beliefs mimic organizational knowledge. The model from March (1991) allows for learning on the level of individuals as well as learning at the organizational level (Figure 5).

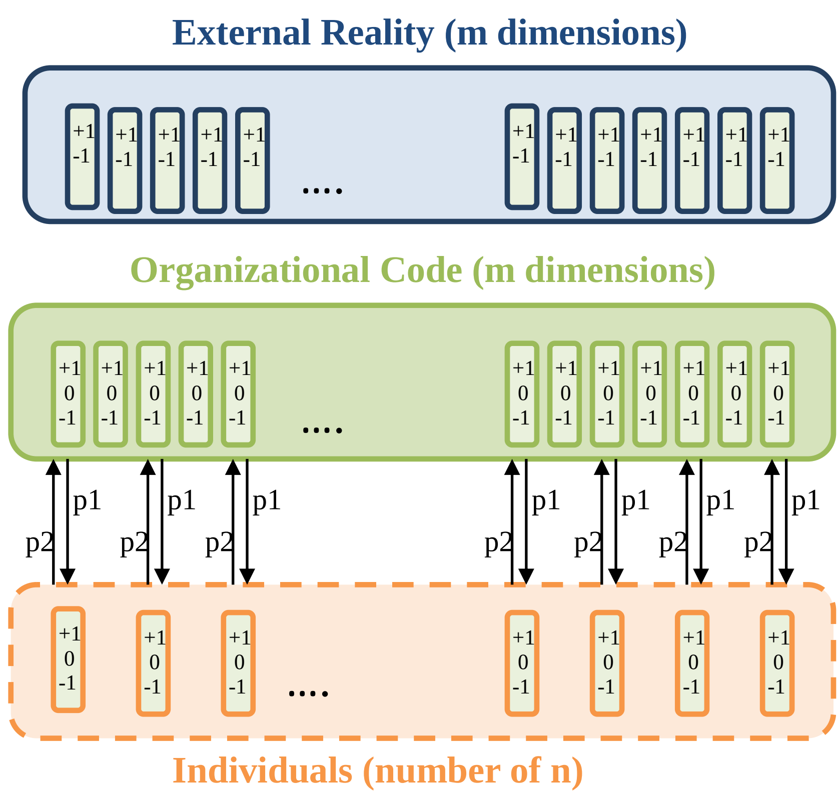


Figure 5: March’s (1991) Closed Model of Organizational Learning

A number of prior studies have applied March’s model of organizational learning as the foundation of their research and extended it in a variety of ways. For example, Kane and Alavi (2007) studied the impact of information technology on exploration and exploitation in organizational learning. They extended the March model by introducing learning mechanisms, specifically communication technology, knowledge repositories of best practices, and groupware. The authors identified that each information technology supported mechanism had a distinct effect on organizational learning dynamics and could be combined in different ways to support organizational learning overall. Kathuria et al. (2011) studied the impact and interactions of culture and knowledge in technology acquisitions. The authors extended March's model to incorporate two organizations, proceeding through an acquisition and a post-acquisition phase of organizational learning. The study identified that cultural integration had a greater impact on post-acquisition performance than the integration of knowledge. Also Miller et al. (2006) extended March's model to allow for direct interpersonal learning to offer the capability of locating specific individuals and to recognize that knowledge has a individual dimension that cannot be transmitted. They concluded that organizations can facilitate learning in cases where prior interpersonal networks were small and isolated from each other.

With regard to extending March's model towards the context of technology acquisitions, the current model is grounded in the closed model, which limits the possibility of factors that increase or reduce the organizational knowledge to the retention level of employees from the acquired firm. As will be explained further, the current model alternates the levels of acquired employee retention and identifies related knowledge levels within the organization.

Knowledge-Acquisition-Model (KAM)

The current model follows the scholarly approach that builds on existing computational models and argues that there is a more effective way to validate existing work and develop a cumulative research tradition than continuously creating new models (Prietula and Watson 2000; Kane and Alavi 2007). This paper considers the closed model from March (1991) as the foundation for the current computational model, which is referred to as the “Knowledge-Acquisition-Model.” The goal of this model is to understand how retained employees from acquired firms influence the knowledge levels of acquiring firms in technology acquisitions. To consider the implications of a technology acquisition, this study starts out with two companies. One is a large and established, and the other is small and technology-oriented. The large company is the acquirer and the small company represents the target firm (Puranam, Singh, and Zollo 2006). Rothaermel and Deeds (2004) noted that exploitation increases with firm size. On the other hand, firms with a high degree of technology innovation exhibit a greater degree of exploration versus firms that refine existing technologies, which are known for high levels of exploitation (March 1991). As such, a technology acquisition will mostly represent an acquisition of an exploration-oriented target firm by an exploitation-oriented acquirer. These considerations from prior academic work influence the setting of basic parameters p_1 and p_2 in my Knowledge-Acquisition-Model.

As identified in the prior literature, one of the major challenges in technology acquisitions is to transfer, integrate, and apply acquired knowledge in order to increase the organizational knowledge level of the acquiring firm. In accordance with Ranft and Lord (2002), knowledge captured in written documents, for example, is easy to transfer.

The problem occurs when companies attempt to transfer individual-level knowledge. As mentioned before, individual-level knowledge resides in the experience and skills of employees (Nonaka 1994). In order to analyze individual knowledge acquisition, this study creates a simulation model based on March's closed model. The key success criteria for technology acquisitions, knowledge transfer and integration, is simplified in this paper by assuming that individual-level knowledge is kept within the individuals of the target company. A knowledge transfer occurs via the retention of employees from the acquired company. Following their successful retention, the KAM model allows organizational learning, the process of exploitation and exploration as simulated in March's model, in order to integrate their knowledge into the acquiring firm (Figure 6). March (1991) defined exploitation as inter-organizational learning of organizational code by individuals (i.e., organizational code shapes individuals) and exploration as the knowledge brought to the organization by individuals (organizational code is shaped by individuals). Consequently, the integration of the knowledge of retained employees from acquired firms occurs via exploration of those individuals' knowledge within the new company. Integration of new knowledge will, in the long run, influence the company's organizational code and, as such, the other individuals (following the March model). However, the retained employees from the acquired firm are also influenced by the existing knowledge in the acquiring firm via exploitation. Running the computational Knowledge-Acquisition-Model (KAM) reveals whether the knowledge transfer will occur and if it is sustainable over the long term by showing an increase in the knowledge level base of the acquiring firm.

The Knowledge-Acquisition-Model consists of the following features:

(1) A common, unobservable external reality: R of m dimensions

(2) Two organizations, Org_1 and Org_2, with n_1 and n_2 number of employees (denoted O_1E_1 and O_2E_2)

(3) The level of exploitation in Org_1 is reflected by the parameter p_{11}; the level of exploitation in Org_2 is reflected by the parameter p_{21}

(4) The level of exploration in Org_1 is reflected by the parameter p_{12}; the level of exploitation in Org_2 is reflected by the parameter p_{22}

(5) $P_{Retention}$, defined as the level of retention of employees from the acquired firm

(6) Organizational code O_1C of Org_1 and organizational code/knowledge O_2C of Org_2

(7) Individual employee knowledge level K

The model consists of four phases:

1. Phase 1: Setup of the model, with two organizations Org_1 and Org_2, at time t_0
2. Phase 2: Running of the model, with Org_1 and Org_2, for the time t_0 to t_1
3. Phase 3: Acquisition of Org_2 and Org_1 at time t_2
4. Phase 4: Running of the model with Org_1, for the time t_2 to t_3

The steps to be followed during phases 1, 2, and 4 are derived directly from March's original model. The steps to be followed in Phase 3, i.e., the acquisition phase, are modeled on the acquisition process and specifically reflect the acquiring firm's retention strategy with regard to employees from the acquired firm.

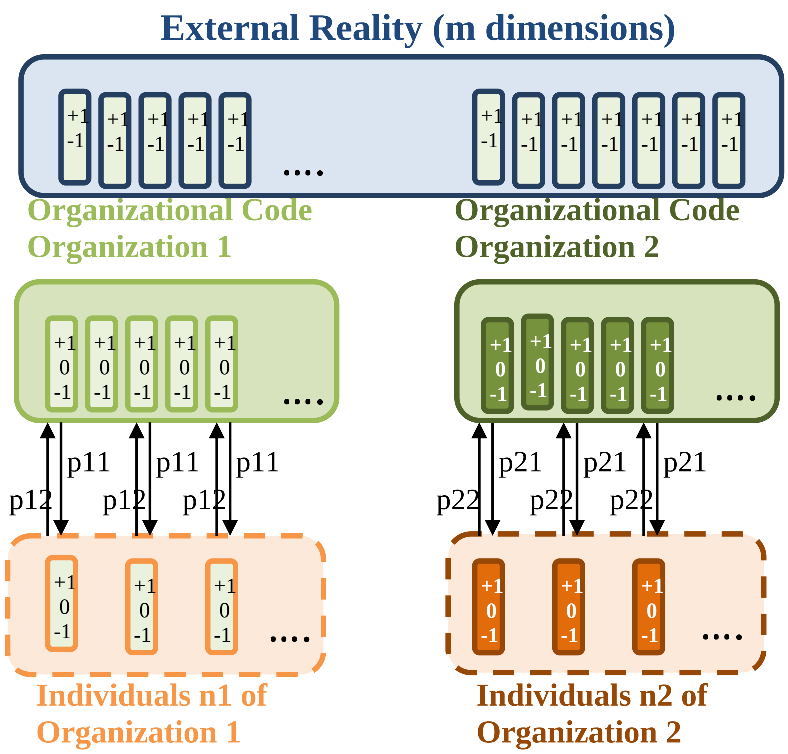


Figure 6: Knowledge-Acquisition-Model Pre-acquisition Phase 2

As stated in the overall description of the Knowledge-Acquisition-Model, the two organizations share a common external reality captured as vector R. It is a 60-digit vector first set to 0 and then randomly drawn from -1 or 1 value, and it remains unchanged for an acquisition run from phases 1 to 4 (Figure 7). The organizational code for both organization 1 OC_1 and organization 2 OC_2 has a similar vector of 60 integers, first set to 0 and then randomly drawn from -1, 0, and 1. The vector indicates the firm's current organizational knowledge and how close it is to reality, revealing the level of organizational knowledge (March 1991). Each employee or agent's individual knowledge level is depicted in a similar vector K. K also consists of 60 integers, which are initialized by random drawings from -1, 0, and +1. K represents the individual's knowledge of reality R. Organizational code OC can influence individual knowledge K via exploitation, which is expressed in p_1. On the other hand, individual knowledge K can impact and change the organizational knowledge OC via exploration, here denoted as p_2.

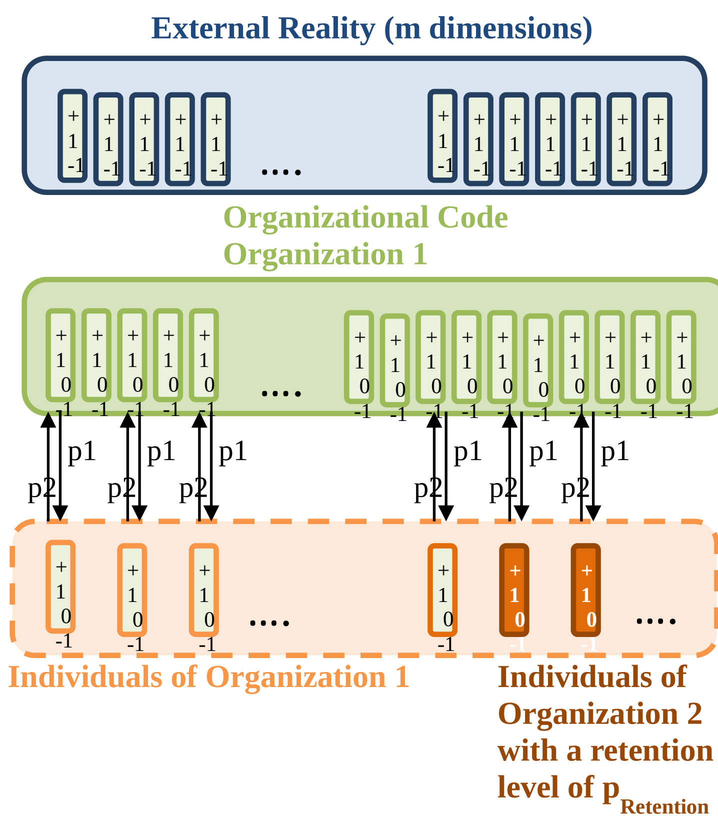


Figure 7: Knowledge-Acquisition-Model Post-acquisition Phase 4

In specific the Knowledge-Acquisition-Model consists of the following variables (Table 2).

Variable	Definition	Boundaries
Org_1	Organization 1, the acquiring firm	
Org_2	Organization 2, the acquired firm	
$O_1E_{n\,(}n1_{)}$	Number of employees in acquiring Organization 1 prior to acquisition	200
$O_2E_{n\,(}n2_{)}$	Number of employees in acquired Organization 2 prior to acquisition	50
O_1Ci	Organizational knowledge/code of acquiring firm, vector of 60 integers (-1, 0,or +1)	-1, 0, +1
O_2Ci	Organizational knowledge/code of acquired firm, vector of 60 integers (-1, 0, or +1)	-1, 0, +1
$O_1E_nK_i$	Individual knowledge level of employees in organization 1 the acquiring firm, vector of 60 integers (-1, 0, or +1)	-1, 0, +1
$O_2E_nK_i$	Individual knowledge level of employees in organization 2 the acquired firm, vector of 60 integers (-1, 0, or +1)	-1, 0, +1
t_i	Time Periods, i=0 set up phase, i=1 pre-acquisition phase, i=2 adding employees from acquired firm, i=3 post-acquisition phase	0, 1, 2, 3
R_i	External reality, vector of 60 integers of values -1 or +1, randomly selected	-1, +1
p_{11}	Exploitation level of acquiring firm organization 1, between 0 and 1	0.8
p_{12}	Exploration level of acquiring firm organization 1, between 0 and 1	0.2
p_{21}	Exploitation level of acquired firm organization 2, between 0 and 1	0.2
p_{22}	Exploration level of acquired firm organization 2, between 0 and 1	0.8
$P_{Retention}$	Percentage of retention of employees from acquired firm	0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0
SG_1	Superior group of organization 1, employees with greater conformity to organizational code/knowledge	
SG_2	Superior group of organization 2, employees with greater conformity to organizational code/knowledge	
Initial periods	Number of periods run pre-acquisition	100
Post acquisition periods	Number of periods run post-acquisition	100
Replications ($p_{Retention}$)	Number of replications per retention level	500

Table 2: Variables of the Knowledge-Acquisition-Model

Computational Simulation and Results

The computational simulation was performed using the Knowledge-Acquisition-Model to simulate the transfer and integration of individual-level knowledge in a technology acquisition through the mechanisms of retention of employees from an acquired firm and organizational learning. The simulation consisted of two March-type organizations: Organization 1, the acquiring firm, and Organization 2, the acquired firm. As prior research has identified, most commonly in the context of technology acquisitions a well-established, larger firm acquires a smaller, innovation-oriented firm (i.e., Puranam, Singh, and Zollo 2006). In order to anchor the Knowledge-Acquisition-Model in those prior academic findings, the acquiring firm, Organization 1, is reflected in the model with a larger employee base of n_1=200 and an exploitation orientation, which is reflected in p_{11}=0.8. On the other hand, the acquired firm, Organization 2, is most commonly small and exploration-oriented, which the model captures with an employee base of n_2=50, a lower exploitation level of p_{21}=0.2, and higher exploration level of p_{22}=0.8.

Each acquisition run considers the above described four phases of set-up, pre-acquisition, retaining employees from acquired firm, and post-acquisition. The pre-acquisition phase aims to establish the two organizations and their knowledge levels independently of each other. This phase is run for 100 periods in order to ensure that the organizations reach equilibrium. At equilibrium the knowledge level of the individuals and the organization are identical. With regard to the acquiring firm, Organization 1, the equilibrium was reached in an average of 6.631 (σ = 0.768) runs. The knowledge equilibrium for the acquired firm, Organization 2, was reached in 30.328 (σ = 3.232) runs. As prior academic work on exploration and exploitation has identified, organizational learning focused on exploitation will lead to quicker short-term gains for the organization but less long-term knowledge; however, exploration-orientation will require a longer period for initial learning but will lead overall to a higher knowledge level (Gupta, Smith, and Shalley 2006). Consequently, exploitation-oriented Organization 1 reached a lower knowledge equilibrium in a shorter period of time, while exploration-oriented Organization 2 required an extended amount of time to reach its higher level of knowledge equilibrium. The results of the model confirm prior theoretical and empirical research.

As scholars in the technology acquisition research stream have identified, the motivation for the acquiring firm is to gain knowledge through the acquired firm (i.e., Graebner 2004). Acquiring companies identify the level of knowledge in acquisition targets through due diligence, and prior research referred to it with terms like "acquired knowledge base" (Ahuja and Katila 2001). The model simulates this circumstance by assuming that the acquired firm Organization 2 has a knowledge equilibrium following phase 2, which is at least 10% higher than the knowledge equilibrium of acquiring firm Organization 1. Only combinations of Organization 1 and Organization 2 that fulfill this requirement will move into phase 3. At the end of the pre-acquisition phase, the knowledge levels of the acquiring firm Organization 1 and the acquired firm Organization 2 were statistically different based on a comparison of their means ($t=-157.598$; $p<0.001$; $df=10998$).

An overview of the descriptive statistics of the variables is provided in Table 3. To maintain simplicity and to distinguish between the original pre-acquisition

Organization 1 and Organization 1 post acquisition, the post-acquisition firm is named Organization 3 O_3 in Table 3.

Variable	**Mean**	**Std.Dev.**	**Min**	**Max**
$p_{Retention}$	0.5	0.316	0	1
O_1E_n	200	0	200	200
$O_1E_nK_i$	0.597	0.063	0.345	0.776
Periods to Ecq O_1	6.631	0.768	5	10
O_2E_n	50	0	50	50
$O_2E_nK_i$	0.734	0.072	0.395	0.929
Periods to Ecq O_2	30.328	3.232	21	43
O_3E_n	225	15.812	200	250
$O_3E_nK_i$	0.745	0.072	0.395	0.929
Periods to Ecq O_3	4.799	1.340	1	12

500 replications per $p_{Retention}$
n = 5,500

Table 3: Descriptive Statistic of Main Variables

Following the initial creation of independent knowledge equilibriums for Organization 1 and Organization 2, the model retains in phase 3 a percentage of employees from Organization 2 (pending the retention strategy) and adds them to the employee base of Organization 1. The simulation based on the KAM model tests retention strategies $p_{Retention}$ at level 0%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, and 100%. As individual knowledge is not observable, the simulation would select retained individuals randomly from the pool of agents/employees in Organization 2. Each retention level creates a specific experimental condition. Prior related research identified that, in order to achieve a power of 0.80, the test requires a sample of approximately 400 for each experimental condition (Kathuria, Fontaine, and Prietula 2011). As such, each retention level consisted of 500 replications.

In phase 4, the post-acquisition phase, the acquiring firm consists of a larger employee base (all of its pre-acquisition employees as well as the retained employees from the acquired firm). The model initiates the process of organizational learning, where new employees are part of exploration and exploitation within the acquiring firm. Phase 4 is run for 500 replications, each of which runs for 100 periods for each of the eleven levels of retention $p_{Retention}$. Following the retention of employees from the acquired firm, the acquiring organization will reach a new knowledge level. Knowledge equilibrium is reached on average after 4.799 ($\sigma = 1.340$) runs.

Post-acquisition performance was measured based on the main motive of technology acquisitions, the relative knowledge gain of the acquiring organization. The relative knowledge gain is defined as the percentage of the average difference in the knowledge equilibrium of Organization 1 pre- and post-acquisition. Consequently, knowledge equilibrium after phase 2 was compared to knowledge equilibrium after phase 4 for Organization 1 and was expressed as a percentage of knowledge gained between phase 2 and phase 4 (Table 4).

$p_{Retention}$	**Average K1 pre-acquisition**	**Standard deviation K1 pre-acquisition**	**Average K3 post-acquisition**	**Standard deviation K3 post-acquisition**	**Absolute knowledge gain**	**Relative knowledge gain**
0%	0.59726	0.063766	0.059726	0.063766	0	0
10%	0.593366	0.065071	0.707539	0.066386	0.114172	0.192414
20%	0.595716	0.060511	0.743915	0.057118	0.148199	0.248775
30%	0.600879	0.062586	0.761325	0.050061	0.160446	0.267018
40%	0.596434	0.068537	0.767227	0.048644	0.170884	0.286553
50%	0.598861	0.061675	0.771383	0.04754	0.172523	0.288085
60%	0.593915	0.0672	0.768836	0.047441	0.174921	0.294521
70%	0.592465	0.065156	0.766795	0.047815	0.17433	0.294246
80%	0.600055	0.061736	0.770907	0.004706	0.170851	0.284725
90%	0.602585	0.059283	0.771994	0.04732	0.169409	0.281138
100%	0.596726	0.000653	0.767968	0.046793	0.171242	0.28697

Table 4: Knowledge Gain between Pre- and Post-acquisition

Overall the results of the virtual experiment identified an average positive knowledge gain for all 5,500 acquisitions (11 retention levels, each with 500 replications, each replication run for 100 periods pre-acquisition and 100 periods post-acquisition). The results from an F test confirm the existence of statistically significant effects of employee retention $p_{Retention}$ from Organization 2 on the post-acquisition knowledge level of Organization 1 ($F(1, 5499) = 506.25$; $p<0.001$). The data identifies relative knowledge gains of at least nineteen percent and up to almost thirty percent pending retention strategy. These results identify that, in technology acquisitions, the retention of employees from acquired firm leads to an increase of organizational knowledge, thus allowing us to state **Proposition 1:**

The retention of employees from the acquired firm provides a mechanism for transferring and integrating individual-level knowledge from the acquired to the acquiring firm, allowing an improvement of the acquiring firm's knowledge level post-acquisition.

With regard to our second research question, the current data allows identification of relations between the level of retention and improvement of the knowledge level of the acquiring firm. From a purely theoretical point of view, one would assume if each individual from the acquired firm carries a certain amount of individual-level knowledge, the more employees from the acquired firm that are retained the better the knowledge level of the acquiring firm will be. However, the current data allows a granular view that reveals that, instead of a simple linear relation, the relative knowledge gain of the acquiring firm reaches a kind of plateau (Figure 8) after approximately forty percent of the employees are retained from the acquired firm. The sample of 5,500 acquisitions offers detailed insights in the relation between the retention strategy of the acquiring firm and the acquiring firm's knowledge gain post-acquisition.

All levels of retention offer an increase in knowledge for the acquiring firm. Between zero and forty percent retention, the relative knowledge gain is in linear relation to the retention level. However, this relation changes at the forty percent retention mark, where, as stated earlier, a kind of plateau is reached. Even when more employees from the acquired firm are retained, the relative knowledge gain remains more or less stable between twenty-eight and twenty-nine percent. Consequently, from a knowledge-based viewpoint, any retention above forty percent does not offer any further gains for the acquiring firm.

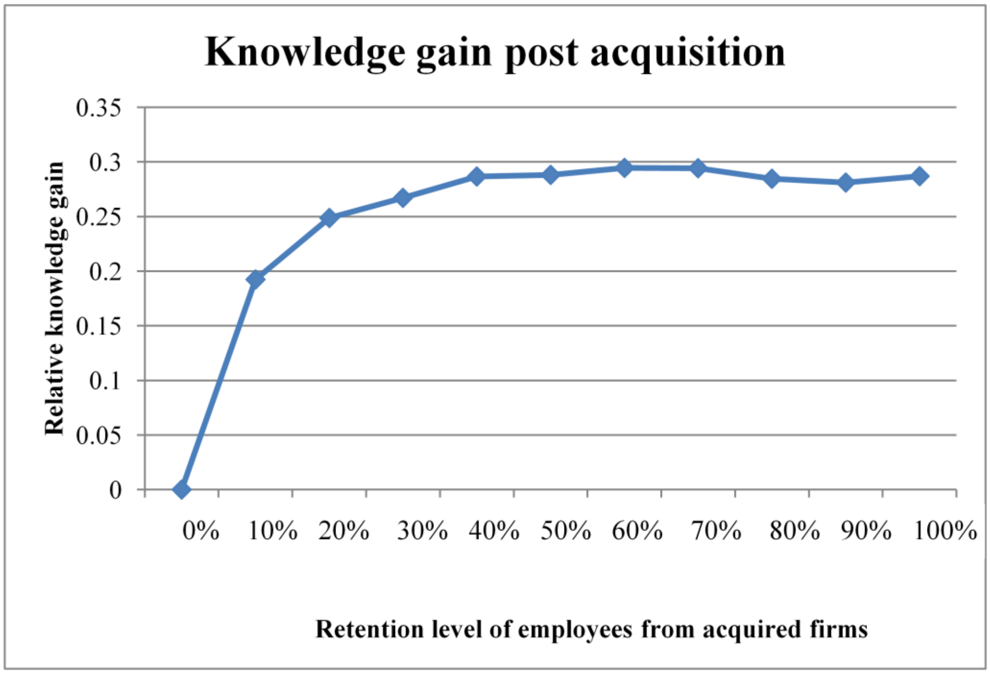


Figure 8: Knowledge Gain related to Retention Level

As identified earlier, the acquiring firm Organization 1 has a strong exploitation-oriented organizational learning and lower level of exploration. However, the introduction of new employees (retained employees from the acquired firm) to the organization disturbs the knowledge equilibrium reached pre-acquisition and introduces individuals with divergent views of Organization 1. The new employees get attention, as their knowledge is by definition greater than the knowledge of Organization 1's knowledge equilibrium (see prior definition of the knowledge level of acquired firm Organization 2). Consequently, they are identified rapidly as a superior group, which March (1991) defined as those individuals whose knowledge matches better with reality than the organizational knowledge/code. Over time Organization 1 reaches knowledge equilibrium again based on exploration and exploitation of superior group knowledge and organizational knowledge. As more employees from the acquired firm are retained, the acquired amount of higher knowledge causes the knowledge level of the acquiring firm to increase; however, the high level of exploitation will impact individual knowledge levels differently, leading to more diverse individual knowledge levels as more employees from the acquired firm are retained and the total number of employees increases.

The simulation results identify a non-linear relation between retention strategy and post-acquisition performance (here considered as the relative knowledge gain of the acquiring firm post-acquisition). The highest increase in knowledge in post-acquisition performance follows a retention level of forty percent and remains stable thereafter. Retaining highly knowledgeable employees from the acquired firm will broaden the company's individual knowledge level and allow, through the exploration of organizational learning, the overall firm to incorporate a higher level of knowledge and reach greater knowledge equilibrium. However, a retention level above forty percent leads to a much larger number of employees overall. This might quickly diversify the individual-level knowledge to such an extent that the superior group no longer consists only of high-knowledge employees from acquired firms but includes the broader base of diverse employees as well. Miller et al. (2006) identified that the larger the number of employees to learn from, the longer it will take to recombine their individual-level knowledge to lead to an overall level of mastery. Schulze et al. (2002, 214) explained: "Knowledge is a double-edged sword: while too little leads to inefficiencies, too much results in rigidities that tend to be counterproductive in a dynamically changing world." The results of this computational simulation concur.

The results lead us to **Proposition 2:**

Variation of retention strategy with regard to the retained amount of employees from the acquired firm provides non-linear improvements of the acquiring firm's knowledge base. Following an initial increase, the retention of employees from the acquired firm and integration of their individual level knowledge exhibit decreasing marginal returns.

Discussion

Scholars of the technology acquisition stream identified that acquisitions of small technology-oriented firms by larger more established firms occur so that the acquiring firms can gain access to new knowledge that they were not able to master in house (i.e., Graebner, Eisenhardt, and Roundy 2010; Graebner 2004; Puranam, Singh, and Zollo 2006). Consequently, post-acquisition performance can be measured as an increase in the knowledge of the acquiring firm. The critical resource within the acquired firm is the knowledge residing within its individuals (Ranft 2006). Prior research indicated that the retention of employees from the acquired firm will allow for the integration of their individual knowledge into the acquiring firm's knowledge level (i.e., Almeida and Kogut 1999; Birkinshaw, Bresman, and Hakanson 2000; Ranft and Lord 2000). However, post-acquisition performance has not been measured as the organizational knowledge level of the acquiring firm in prior research. Even so, it has been clearly named the ultimate objective. In addition, the relationship of post-acquisition performance to various retention strategies of the acquiring firm was unclear. The review of prior management theories as well as empirical research led to the development of two propositions.

March's (1991) organizational model offered computational representation of major theoretical constructs: organizational- and individual-level knowledge as well as organizational learning through exploration and exploitation. The Knowledge-Acquisition-Model allowed the computational simulation of technology acquisitions with a variety of retention strategies for the acquiring firm. The results of the computational simulation offer new insights into the relation between post-acquisition retention strategy and post-acquisition performance of the acquiring firm. This approach follows the recommendations of Davis et al. (2007) with regard to developing theory through computational simulation methods.

The Knowledge-Acquisition-Model features two organizations, which in themselves are considered closed systems without taking into account environmental turbulence or turnover (March 1991). These two organizations merge their employee bases following an acquisition. The acquiring Organization 1 follows a certain retention strategy $p_{Retention}$. Employees from the acquired organization, with their individual knowledge level equal to the knowledge equilibrium of the acquired Organization 2, will be integrated into the employee base of Organization 1. Following March's model of exploration and exploitation, two important aspects of organizational learning will allow Organization 1 to integrate the acquired individual knowledge levels. The Knowledge-Acquisition-Model considers exploitation as the learning of individuals from organizational knowledge and exploration as the learning of the organization from individual knowledge. Post-acquisition performance is measured as the relative gain in knowledge of the acquiring firm, which is evident when the acquiring firm's knowledge equilibrium pre- and post-acquisition is compared. The findings of the computational simulation suggest that retention of employees from the acquired organization always has a positive impact on the post-acquisition knowledge level of the acquiring organization. However, the relative gain in knowledge is not linear to the retention level but rather plateaus after an initial increase. This plateau identifies that any retention strategy between forty and one hundred percent yields similar post-acquisition performance for the acquiring firm, and, as such, does not identify a single retention strategy that is most optimal.

Limitations

The creation of a simulation model faces the tension between simplicity and elaboration. In order to be closer to reality, one can always consider adding another variable to the model. No doubt the model could be made more "realistic" by adding more variables, but, at the same time, the model would become more difficult to understand. In more complex models, it is difficult to understand what drives the result one is able to observe in the virtual experiments. Harrison et al. (2007) identified that the more realistic a model of an organization, the more it resembles a real organization, including its aspects of incomprehensibility and indescribability. The Knowledge-Acquisition-Model of this study followed Axelrod's (1997) recommendation to keep it simple, stupid (KISS); the simpler the model, the easier it is to gain insights into the causal processes.

With regard to Axelrod's KISS and to support the validity of the model, the current Knowledge-Acquisition-Model is based on the existing model of organizational learning from March (1991). It was kept as a closed model and did not allow for March's extension of employee turnover and environmental turbulences. Therefore, the focus was on the main process of interest for the current research questions of this paper: how organizational-level knowledge of an acquiring firm is impacted by the retention of employees from an acquired firm as the individuals from acquired firms and their individual-level knowledge are added to the existing base of employees. Prior empirical work on technology acquisitions provided most of the information with regard to the different sizes of acquiring and acquired organizations, the levels of exploration and exploitation at acquiring and acquired firms, and the acquired firm's reflection of a higher level of knowledge than the acquiring firm.

An additional limitation is that the generated data from the simulation model does not represent real observations, so the techniques for the analysis are very limited. It is also considered risky to generalize findings from virtual experiments to areas beyond the parameter space not examined in the simulation. Consequently, the present results and implications only relate to the specified parameters and processes of the Knowledge-Acquisition-Model, the retention of employees from the acquired firm, their addition to the acquiring firm's employee base, and organizational learning through exploration and exploitation pre- and post-acquisition.

Implications

The Knowledge-Acquisition-Model allows us to measure the post-acquisition performance of a technology acquisition based on the acquiring firm's main motive: the desire to improve and increase its relevant knowledge. As such, the model allows the extension of prior theoretical and empirical work in technology acquisitions, identifying that retaining employees from the acquired firm and integrating them into the acquiring organization offers mutual learning within the firm and always yields a positive impact on the post-acquisition knowledge level of the acquiring firm. However, the results of the computational simulation also reject the notion that a higher level of acquired knowledge retention leads to a steady, linear increase in the post-acquisition knowledge of the acquiring firm. The results of the computational model reveal that the relation is non-linear and plateaus after a retention of more than forty percent.

As technology companies acquire smaller, highly innovative technology-focused firms, the majority of knowledge that the acquiring firms aim for might reside in specialized areas of acquired firms, for example, the technical people in the Research & Development area and specifically the innovators (Birkinshaw 1999). However, other areas, like the administrative body of accountants, human resources, as well as tax and legal, might not contain the specific technological knowledge that acquiring firms seek (Schweizer 2005). However, an increase in the retention rate, especially one above forty percent, increases the likelihood that not only the technological knowledge but also more the generic knowledge will be retained, which might not necessarily lead to an increase in knowledge that is transferable to post-acquisition performance. The results of this paper have practical implications for the management of technology firms considering an acquisition as a means of gaining technical competencies and knowledge. The management of technology firms should conduct rigorous knowledge due diligence of the firm they aim to acquire. This pre-acquisition phase should establish that the knowledge level of the acquired firm is higher than the knowledge level of the acquiring firm.

Future Research

A number of possible extensions of the current Knowledge-Acquisition-Model could be interesting to pursue in the future. A distinction of individual knowledge might be especially interesting, as it would allow for identification of technological from non-technological knowledge carriers amongst employees. This would allow firms to investigate whether the sole retention of technological knowledge yields greater post-acquisition knowledge than the retention of a mixed form of knowledge. Schweizer (2005) identified that the level of post-acquisition integration varies based on what type of knowledge the individuals possess or from which area of the acquired organization they come. The addition of hierarchical levels into the employee base might also be of interest, as prior empirical research shows mixed results regarding the retention or lay-off of acquired management and the implications on post-acquisition performance. Graebner (2004) identified that retained acquired managers provide value to post-acquisition performance beyond the considerations of the acquiring firm. Overall, it is suggested that future research can be usefully directed towards a more explicit understanding of individual employee retention given the findings of this paper, which suggest that so much of the organizational knowledge gained from of an acquisition depends on the retention of individuals.

In addition, one has to consider the question of whether or not to retain employees from an acquired firm is not a one-sided decision. It is not only the acquiring firm’s call whom they will retain following the acquisition. The employees from the acquired firm also have a choice in whether they want to remain with the acquiring firm or seek employment someplace else. The management literature especially identifies that quite often the management of the acquired firm leaves shortly after a acquisition, taking their knowledge with them (i.e., Cannella and Hambrick 1993; Krug 2003). However, prior research is limited on knowledge workers choices, whether they want to remain with the acquiring firm or consider employment at other firms. Follow up research is needed to indentify why knowledge workers would prefer to stay with the acquiring firm and consequently what strategies acquiring firms can use to keep acquired knowledge workers that are of special interest to the acquiring firm.

Conclusion

The pace and magnitude of technological change and subsequent depreciation of knowledge leaves many information technology firms short of relevant knowledge for future products and innovations. An increasing amount of firms turn to external acquisitions in order to gain relevant technological knowledge through so called technology acquisitions. However, the relevant knowledge is not necessarily easily articulated and transferable. It is more likely that vast amounts of knowledge reside on an individual level with the employees of the firm. As firms venture out to acquire relevant technological knowledge, their management needs to consider strategies that allow the transfer and integration of acquired knowledge into the acquiring firm, which allows, through the process of organizational learning, an increase and improvement of the acquiring firm’s knowledge level. This study questioned whether the retention of employees from acquired firms will increase acquiring firms’ knowledge and whether variations in retention level (retention strategy) provide similar results with regard to knowledge levels of the acquiring firms.

In order to investigate the effect of retention levels of employees from the acquired firm on the post-acquisition knowledge level of an acquiring firm in the context of a technology acquisition, this study applied a computation simulation with the Knowledge-Acquisition-Model. The model relies on the prior work of March (1991) and his computational model of organizational learning. The conditions and set-up of the computational simulation in this paper were based on prior theoretical and empirical work in the research stream of technology acquisitions within management literature. The computational simulation of technology acquisitions considered two independent organizations with different knowledge levels; a larger, more exploitation-oriented firm acquired a smaller, more exploitation-oriented firm. During the acquisition a certain percentage (pending the retention strategy) of employees from the acquired firm was retained and integrated into the employee base of the acquiring firm. The process of organizational learning through exploration and exploitation within the acquiring firm allowed it to learn from the acquired individuals who were retained.

The results from the computational simulation offer two main findings that extend the current literature on technology acquisitions. First, the retention of employees from the acquired firm will provide a mechanism for transferring and integrating individual-level knowledge from the acquired to acquiring firm, allowing an improvement of the acquiring firm’s knowledge level post-acquisition. Secondly, the variation of retention levels (retention strategy) with regard to the amount of employees from the acquired firm that are retained provides non-linear improvements of the acquiring firm’s knowledge base. Specifically, a higher level of employee retention from the acquired firm leads to higher knowledge gains for the acquiring firm. However, the retention of employees from an acquired firm and integration of their individual-level knowledge exhibits decreasing marginal returns. Consequently no single “best” retention strategy can be recommended beyond that point. Retention of employees from the acquired firm is an important consideration in post-acquisition integration strategies in order to provide the means to transfer and integrate acquired individual-level knowledge. This paper has tried to move towards a better understanding of the relation between the retention level of employees from the acquired firm and the knowledge gain of the acquiring firm, as such extending our current knowledge of antecedents of technology acquisition performance.

Knowledge as the Motive of Technology Acquisitions: Can Firms Retain the Acquired Knowledge?

Introduction

Technology acquisitions remain a dominant corporate strategy for firms in the high-tech industry to gain access to technological knowledge they require but do not have or are not able to develop in-house (Chaudhuri and Tabrizi 1999; Graebner, Eisenhardt, and Roundy 2010). In order to understand why some technology acquisitions succeed where others fail, academic research has identified that retention of employees from acquired firms is important for allowing access and integration of their individual-level knowledge (Ranft and Lord 2000; Ranft and Lord 2002). However, management research has concluded that, at times of merger and acquisitions, employees from acquired firms are more likely to leave acquiring firms voluntarily and seek employment elsewhere, taking their individual-level knowledge with them (Cannella and Hambrick 1993; Krug and Hegarty 2001). What has not yet been considered is that technology acquisitions can lead to increased voluntary turnover amongst employees from acquired firms.

For employees, the merger or acquisition of their firm can create a shock, as their firm ceases to exist or might be fundamentally changed (Holtom, Mitchell, and Lee 2005). This can trigger a phase of unclear organizational commitment as well as a high level of uncertainty with regard to organizational change and personal status (Cartwright and Cooper 1990). These circumstances have been identified as prime factors for individuals' voluntary turnover decisions (Lee and Mitchell 1994; Lee et al. 1999). Interestingly, academic work in the field of organizational research has devoted considerable attention to the empirical examination of how being acquired affects top management, particular their voluntary departure rates (Cannella and Hambrick 1993; Krug 2003; Krug and Hegarty 2001). However, far less attention has been directed towards comprehending turnover related to mergers and acquisitions in the realm of knowledge workers from the acquired firms, where the technological knowledge work is actually done. This study adopts the perspective of the knowledge worker, specifically the corporate inventor from the acquired firm, and theorizes the effects of acquisition on individual turnover and retention.

Drawing from the knowledge-based view of the firm, one of the central challenges in technology acquisitions is that the resources that motivate acquisitions in the first place, that is, technological knowledge, is mostly individual knowledge residing within knowledge workers (Ranft and Lord 2000). In knowledge-intensive and innovation-driven industries like the software industry, skilled human capital is one of the most sought-after strategic resources (Ranft 2006; Graebner 2004). As managers of successful serial acquirers have understood, and as CISCO's CEO Joe Chambers put it simply, "In a high-tech acquisition you really are acquiring only people" (Byrne 1998, 102). Similarly, David Rhodes, the chairman of Filtronic, explained that the key assets in their technology acquisitions are engineers. By acquiring a company Filtronic acquires its intellectual property, but they really want to retain the engineers (Rhodes 2000). However, the individuals might chose to leave the acquiring firm and seek employment with a third party, and if the acquiring firm is not able to retain those knowledge workers (here inventors), it loses the strategic resources it sought to acquire in the first place.

There are two possible pathways for advancing insights into the un-desired loss of technological knowledge due to the voluntary departure of inventors from acquired firms. One approach is to examine who left and why. A second approach, and the one this study pursues, involves turning the question around by asking, which of the inventors from acquired firm stayed and what factors influenced the level of retention? This paper considers the unexplored idea that not all technology acquisitions cause the same level of voluntary turnover amongst inventors from acquired firms. Drawing on earlier voluntary turnover and employee retention research, this study argues that the level of job embeddeness positively influences inventors' decisions to remain with an acquiring firm. From this literature, it is known that job embeddedness is negatively related to voluntary employee turnover; job embeddedness represents a broad constellation of influences on employee retention (Mitchell et al. 2001). The three main dimensions of job embeddedness refer to links, fit, and sacrifice. Specifically, links relate to the extent to which employees have links with other employees or activities. Fit considers the extent to which people's jobs are similar to aspects in their environment, and sacrifice relates to the ease with which employees can break links (Mitchell et al. 2001). This paper posits that in technology acquisitions the retention of inventors from acquired firms is higher when the acquired and acquiring firms have prior relations that allow employees to form links between the two companies; also, the retention level of inventors from acquired firms is higher when the acquired and acquiring firms have a certain level of similarity (here ownership structure); and third, the retention of inventors from acquired firms is higher when the acquisition implies less potential personal sacrifice, for example due to close geographical proximity, which relieves the need for employees from acquired firms to relocate.

This study tests its theory in the software industry, a setting in which technological knowledge is essential and where technology acquisitions are often made with the expressed aim of obtaining new technological knowledge. Using data from the Security Data Company (SDC) Thomson Mergers and Acquisition database as well as the United States patent database, we identified 7,453 acquisitions of U.S. software companies between 2000 and 2005. Of these only 246 acquisitions are technology acquisitions of firms that had patents prior to their acquisition. Amongst those acquired firms we identified and tracked patenting activity of 1,613 individual inventors pre- and post-acquisition. This study finds considerable support for our hypotheses that similarity between acquired and acquiring firms provides a context in which more inventors from acquired firms remain with the acquiring firm. However, the empirical data does not support considerations that prior relationships or close geographical proximity between the acquired and acquiring firms impact the retention level of inventors from acquired firms.

By considering the idea that certain technology acquisitions have different levels of voluntary turnover of inventors from acquired firms and, as such, different levels of risk for losing acquired technological knowledge, this study opens up a line of inquiry that can lead to new theoretical and practical insights. Theoretically, this research adds a new perspective on advancing technological acquisition research by examining the retention rate of inventors from acquired firms under changing conditions. Namely, some acquiring firms are not able to retain any inventors from acquired firms and consequently do not gain access to new technological knowledge nor benefit from added innovative performance. Others are able to retain inventors and can access their individual technological knowledge and experience and thereby increase the firm's innovative performance following a technology acquisition. Mitchell et al. (2001) introduced the idea that job embeddedness may affect employee retention; however, researchers have not incorporated why people choose to stay with acquiring firms into subsequent thinking about technology acquisitions. This paper thus adds new elements to our eventual understanding of why some technology acquisitions succeed where others fail.

On a practical level, this study might lead acquiring firms to assess the level of links and similarities between themselves and the firms they aim to acquire, as well as the level of personal sacrifice employees from acquired firms might have to make, in order to anticipate and evaluate the level of voluntary turnover amongst knowledge workers. Pending this assessment, managers of acquiring firms might need to prepare strategies in conjunction with their human resource departments to take pro-active action against voluntary turnover early in acquisitions in order to reduce the risk of losing the technological knowledge they set out to acquire in the first place. The current paper may open a new stream of research and practical ideas based on the premise that technology acquisitions may not have a uniform affect on voluntary turnover amongst knowledge workers from acquired firms. Instead some technology acquisition constellations might see very limited voluntary turnover tendencies versus others who might see a severe departure rate of knowledge workers and their individual knowledge.

Theory and Hypotheses

Technology Acquisitions

In high-velocity industries the performance and survival of a firm depends on its ability to innovate in quick successions (Brown and Eisenhardt 1997). In addition, the speed of technological change often leaves companies short of mission-critical knowledge to develop new products (Wadhwa and Kotha 2006). Following the resource-based view (Wernerfelt 1984; Barney 1991), firms pursue acquisitions in order to obtain required resources like technological knowledge (Chaudhuri and Tabrizi 1999; Ranft and Lord 2000). John Chambers, Cisco's president, has stated, "If you don't have the resources to develop a component or product within six months, you must buy what you need or miss the opportunity" (Bower 2001, 99). A merger or acquisition provides the acquiring firm with permanent and exclusive access to the acquired firm's knowledge base (Graebner, Eisenhardt, and Roundy 2010; Hagedoorn and Dysters 2002). Mergers and acquisitions, as such, can be considered a means to access these competitive resources, allowing acquired knowledge to extend the acquiring firm's knowledge base (Capron and Mitchell 2009). Dominant amongst those types of acquisitions is the so-called technology acquisition, the acquisition of a technology-based firm by an established firm (Granstrand and Sjölander 1990; Graebner and Eisenhardt 2004). More often, large established firms may choose the external acquisition of technological knowledge over internal development, as small firms are commonly more innovative because they appear more attractive to new talent (Zenger and Lazzarini 2004).

Prior academic work in the area of technology acquisitions has studied post-acquisition performance conditioned on a variety of factors. One stream of research considered the level of post-acquisition integration with regard to acquisition performance (i.e., Puranam, Singh, and Zollo 2006; Puranam and Srikanth 2007; Puranam, Singh, and Chaudhuri 2009). The goal is for the acquiring firm to access the acquired knowledge and commercialize it. The question is whether to keep the acquired firm as an autonomous unit or to integrate it into the acquiring firm. Scholars identified that a possible solution to the so called “coordination-autonomy-dilemma” depends on whether the acquiring firm desires to have the acquired firm produce more innovation and, as such, keep it autonomous versus tapping into the acquired firm’s knowledge base and integrating the knowledge in general with the acquirer’s knowledge (Puranam, Singh, and Zollo 2006; Puranam and Srikanth 2007). Based on his in depth case studies, Schweizer (2005) proposed that post-acquisition integration occurs on a variety of levels depending on the functional area of the firm.

Another stream of research links post-acquisition performance to the retention of employees from the acquired firm. Graebner (2004) identified that retained managers from acquired firms had a key role in post-acquisition performance; retaining them enabled the acquired firm to preserve its pre-acquisition performance, and the retained managers also identified synergies and opportunities post-acquisition beyond the acquisition plan. Ranft and Lord (2000; 2002) applied a knowledge-based view of the firm, positing that the largest amount of desired knowledge from the acquired firm resides within the employees. In order for the acquiring firm to gain access to individual-level knowledge of the employees from the acquired firm, the retention of these employees is of utmost importance. Their survey of technology acquisitions in the biotechnology, computer equipment, and computer software and services industries supported the hypotheses that the retention of key employees is positively associated with the transfer of technological knowledge from the acquired to the acquiring firm (Ranft and Lord 2000). In mergers and acquisitions, where the knowledge resources of the acquired firm are critical, the human integration has to be handled with care in order to respect and retain the knowledge workers that are acquired (Birkinshaw 1999).

Knowledge and Knowledge-based Views of the Firm

As knowledge is one of the critical resources firms aim to acquire in technology acquisitions, firms need to understand where knowledge resides within the acquired firm and how it can be transferred and integrated to increase the acquiring firm's knowledge base. In order to explore the context of technology acquisitions, this paper considers the knowledge-based view of a firm, where a "firm is conceptualized as an institution for integrating knowledge" (Grant 1996, 109). From this point of view, firms are repositories of different sets of knowledge. Leonard (1995) explained that a firm owns a number of knowledge assets, in specific individual-level knowledge, physical systems, management systems, and the norms that support knowledge creation. Similarly, Walsh and Ungson (1991) posited that there are a variety of knowledge repositories within an organization: its individual employees, its roles and structures, its standard operating procedures, its culture, and the physical structure of its workplace. Also Kogut and Zander (1992) identified that knowledge is not only held by individuals; in addition, knowledge is also expressed in how the employees of an organization cooperate. Here knowledge is embedded in an organization's principals, through which the individuals interact with each other.

An ongoing debate amongst knowledge and organizational knowledge scholars is whether the individual or the collective is the locus of knowledge and at what level is new value is created. Felin and Hesterly (2007) question whether innovations are the result of ideas from a collective process that is independent of individuals or whether they start with the individuals. Simon (1991) concludes that an organization only learns based on the individuals of which it is composed. Only individuals are real, and they, therefore, determine organization and outcome. Common amongst prior academic work is the assumption that knowledge resides on individual as well as organizational levels. However, only individual-level knowledge can capture more than the explicit dimension. Explicit or codified knowledge refers to knowledge that can be transferred in formal documents or any type of systematic language (Nonaka 1994), like an owner's manual that can contain knowledge about the correct operation of a product (Alavi and Leidner 2001). However, knowledge that can be expressed in words and numbers only represents the tip of the iceberg of the entire body of knowledge (Nonaka 1994). In his foundational study, Polanyi states, "I shall reconsider human knowledge by starting from the fact that we can know more than we can tell" (Polanyi 1966, 4). Individual-level knowledge includes insights and intuition and is difficult to formalize and hence hard to share (Becerra-Fernandez and Sabherwal 2001). Individuals not only have information but are also able to integrate and frame information within the context of their experience and expertise and by this create new knowledge (Grover and Davenport 2001). From this fundamental point of view, all knowledge originates from individuals. Knowledge is to a significant extent a priori, innate, and heterogeneous at the individual level (Felin and Hesterly 2007). An organization cannot create knowledge without individuals; however, an organization can support its individuals and provide them with an environment in which to create new knowledge (Nonaka 1994). Consequently, it is individuals and their knowledge that firms aim to acquire in order to gain knowledge. A person's individual-level knowledge is an especially valuable competitive resource because it cannot be codified and, as such, is very difficult for any other firm to imitate (Barney 1991). However, managing this acquired valuable competitive resource—the individual/employee from the acquired firm—creates a unique challenge in the context of mergers and acquisitions.

Human Resources in Mergers and Acquisitions

Prior research related to the human resource aspects of mergers and acquisitions considers that mergers and acquisitions represent sudden and major change for all involved employees (Cartwright and Cooper 1990). Researchers in the field of employee retention and voluntary turnover consider mergers and acquisitions as shocks (Holtom, Mitchell, and Lee 2005). Lee and Mitchell (1994) and Lee et al. (1999) identified that, not job dissatisfaction but rather a shock event prompts employees to re-evaluate their current jobs and organizational commitment. In addition, for the employees from acquired firms, that their employer ceases to exist or will be fundamentally changed following a merger and acquisition triggers a phase of unclear organizational commitment (Cartwright and Cooper 1990). Also losing a workplace and former sense of identity, the employees from acquired firms face a high level of uncertainty with regard to organizational changes, personal status, and career perspectives, new working relationships, etc. (Cartwright and Cooper 1990, 1993). Considering prior research on voluntary employee turnover, mergers and acquisitions create an environment that increases the likelihood of employees leaving their employment voluntarily.

Not surprisingly, many acquiring firms experience an unplanned and often undesired exodus of knowledgeable employees post-merger or post-acquisition (Cartwright and Cooper 1993). Especially in technology acquisitions, where the aim is to acquire knowledge that is mostly held by individuals, the most obvious challenge for managers of acquiring firms is when the acquired knowledge walks out the door (Coff 1997).

Scholars have studied the departure of top managers following mergers and acquisitions. Walsh (1988) confirmed an increased rate of top management turnover in merged versus non-merged companies. Krug et al. (2001) identified that top managers' decisions whether to stay or leave depended on how secure they felt in their jobs, their understanding of the new company culture, and their overall perception of the merger announcement. The unplanned departure of executives from acquired firms can be harmful to post-acquisition performance. Cannella and Hambrick (1993) identified that managers are a component of the acquired firm's knowledge resource base, and their retention is, therefore, an important determinant of post merger or acquisition performance. Similarly, Wulf and Singh (2011) argue that top managers of acquired firms are valuable human capital that will enhance a firm's post-acquisition performance; consequently, their retention can build competitive advantage.

Innovators from Acquired Firms

Scholars have also studied the effects of acquisitions on the performance of knowledge workers. Prior research considered that innovators within acquired firms, the individuals named on the patents of acquired firms, should be of particular interest to the acquiring firm. Ernst and Vitt (2000) questioned the innovative performance of inventors from acquired firms in the mechanical and chemical manufacturing industry. They identified that key inventors leave their new firms to a substantial extent, and the ones that remain significantly reduce their innovative performance. Kapoor and Lim (2007) analyzed acquisitions in the U.S. semiconductor industry and identified inventors from the acquired firm based on its patents. Their study indicates a drop in the innovative productivity of inventors from acquired firms following acquisitions in comparison to a control group of patent inventors whose companies were not acquired. Similarly, Paruchuri et al. (2006) identify a drop in the post-acquisition productivity of inventors from acquired firms in the pharmaceutical industry. Here post-acquisition integration especially affects inventors’ productivity negatively. These findings have been confirmed by Puranam and Srikanth (2007) with regard to innovators from acquired firms in the manufacturing industries of computing and pharmaceuticals.

In order for a technology acquisition to succeed, one has to identify not only what factors affect inventors from acquired firms and help them to remain productive (Ernst and Vitt 2000; Kapoor and Lim 2007) but even more so what factors can possibly affect knowledge workers’ decision to stay with acquiring firms. Research has fallen short of considering why some technology acquisitions succeed where others fail in the context of voluntary turnover of knowledge workers from acquired firms. Specifically one aims to understand why knowledge workers from acquired firms stay following a merger and acquisition with some acquiring firms and not with others.

Voluntary Turnover

In order to understand why knowledge workers of acquired firms stay or leave, one has to consider current theory and research on voluntary turnover. Most of the known work is based March and Simon's (1958) ideas with regard to individuals' desire to leave their jobs and the perceived ease of such moves. The perceived ease of movement is reflected in job alternatives, while perceived desirability of leaving a job is usually reflected in job satisfaction. Most of the traditional models of employee turnover consider two main categories of factors that influence employee decisions to leave current employment; one emphasizes the employee's attitude toward the job, including job satisfaction and employee commitment, and one emphasizes the ease of moving, for example, to perceived job alternatives (Maertz and Campion 1998). However, researchers have identified that even when prior research related to attitude, perceived alternatives, search, and turnover found statistically significant results, the variables control less than five percent of the variance in turnover (Griffeth, Hom, and Gaertner 2000). Not surprisingly, over the last few years, researchers have attempted to break away from the common attitude and alternatives model. The consideration of job embeddedness especially defines a growing body of literature with regard to turnover. According to Mitchell et al. (2001), job embeddedness is defined as a broad constellation of factors influencing employee retention. In specific, the authors identify three critical aspects related to job embeddeness: (1) the extent to which people have links to other people or activities, (2) the extent to which people's jobs and communities are similar with other aspects in their environment, and (3) the ease with which people can break links through, for example, physical moves to other states. Overall Mitchell et al. (2001) identified that job embeddeness is negatively related to voluntary employee turnover. Applying the theory of job embeddeness to the context of technology acquisitions and, in specific, to the question of inventor retention, one would have to assume that the higher the job embeddeness of inventors from an acquired firm within an acquiring firm, the higher the retention level of these inventors. In order to test this very broad hypothesis, one needs to differentiate amongst the three aspects of job embeddeness.

Job Embeddedness – Links

First this study starts out with the consideration of inventors from acquired firms having links to other people or activities within the acquiring firm. Links are characterized as formal or informal connections between people. The theory of job embeddedness suggests that the more links an employee has to others the more the employee is bound to the job or the organization (Mitchell et al. 2001). Relations like strategic alliances or joint research and development projects between the two firms prior to the acquisition would allow inventors from acquired firms to form informal relationships and personal networks and overall offer them the opportunity to create links with the employees of the acquiring firm. Perry (1986) identified that prior relationships between acquiring and acquired firms can positively affect post-acquisition integration success. Porrini (2004) also found in a sample of manufacturing firms that previous alliances improved acquisition performance as measured by change in return on assets.

However, Ernst and Vitt (2000) identified that research and development relations between the firms prior to an acquisition had no influence on the individual inventors' post-acquisition performances. If relations between the inventors from the acquired firm and the research and development department of the acquiring firm already exist prior to acquisition, those personal connections should offer the inventors from acquired firms insights, like understanding the company culture and procedures, into their new firm. The relationship should also offer employees opportunities to get to know each other and ease any concerns about a joint future. If created ahead of time, the social network should help to ease any feelings of insecurity on the side of the inventors from acquired firms. Also, the acquiring firm would know who the inventors within the acquired firm are and place emphasis on their retention. Overall, a relationship prior to the acquisition should reduce the level of uncertainty and increase the level of retention amongst employees from the acquired firm.

Hypothesis 1: In technology acquisitions the level of retention for inventors from acquired firms is higher when the acquired and acquiring firms have prior research and development relationships.

Job Embeddeness – Fit

In addition to pre-existing links, the theory of job embeddeness also identifies that similarity or fit might impact employee retention level. Prior research indicates that the targets of technology acquisitions are commonly entrepreneurial firms, sometimes even without a product yet launched to the market (Puranam, Singh, and Zollo 2006). Similarly Schweizer (2005) identified that target firms in technology acquisitions are most often risk taking, innovation-driven, entrepreneurial firms. The majority of these firms are still privately owned, sometimes just in preparation for an Initial Public Offering (IPO) or just succeeded in an IPO (Goldblatt 1999). Privately held entrepreneurial firms are attractive to knowledge workers like inventors as they allow them more freedom, more chances to do things their own way (Birkinshaw 1999). Inventors from acquired firms have most likely chosen their current firm due to the fact that they feel comfortable working within a certain type of organizational environment and corporate framework. They might seek to continue their employment in a similar firm. The inventors employed within privately held firms might value the freedom and less bureaucratic ways that are possible in small private firms and seek a similar legal form of ownership in their future employment.

Hypothesis 2: In technology acquisitions the level of retention of inventors from acquired firms is higher when acquired and acquiring firms have similar legal forms of ownership.

Job Embeddedness – Sacrifice

The third aspect of job embeddedness refers to loss, or what employees might have to give up. Especially when the acquired and acquiring firms are located in geographically distant locations, an acquisition can create the threat of re-location for the employees from the acquired firm. Inventors within acquired firms especially might fear relocating to acquiring firm's research and development centers. Mobility and a willingness to relocate are not easily achieved among employees. Landau et al. (1992) identified that factors outside the job itself can influence an employee's willingness to relocate; these include individual attributes as well as family and community influences. People such as inventors, who have many career opportunities, might be less willing to relocate to remain employed. Those individuals might perceive that alternative job opportunities without the hassle of relocation exist with other firms (Landau, Shamir, and Arthur 1992). In addition, when an individual has lived in a certain geographical area, this individual might become increasingly integrated into the social structures of the community, hence, willingness to relocate might decline (Gould and Penley 1985). Similarly, Stroh (1999) identified that firms face an increased resistance from employees who are unwilling relocate, as relocation can disrupt social networks and separate families and friends (Clark and Huang 2006). Consequently, when the acquired and acquiring firms are located at great distances from each other, one has to assume that the threat of a possible relocation posed by the acquisition can affect the retention rate of inventors from the acquired firm.

Hypothesis 3: In technology acquisitions the level of retention of inventors from acquired firms is higher when the acquired and acquiring firms are located in close geographical proximity.

Taken together, hypotheses 1 through 3 argue that job embeddeness has a direct impact on the level of retention of inventors from acquired firms in technology acquisitions. Specifically, this study proposes (1) that links between acquired and acquiring firms in the form of prior research and development relationships impact the level of retention. It also proposes (2) that similarity of legal forms of ownership between acquired and acquiring firms and (3) that a reduced threat of re-location and the opportunity to maintain personal and community related ties will impact inventors’ willingness to remain within the acquiring firm. Next this paper presents an empirical study that tests these hypotheses and, in the process, explores what percentage of inventors from acquired firms in technology acquisition remain with acquiring firms and continue to innovate.

Methods and Data

Empirical Context

This study tests the hypotheses on data from the software industry, specifically acquisitions of services-pre-packed software firms (SIC code 7273) in the United States. Software firms are an ideal context for this empirical analysis for several reasons. The software industry is characterized as a high velocity industry where complex technological products enter the market in short successions. This rapid innovation requires highly specialized skills and know-how within software firms. For many established firms the pace and magnitude of technological change and subsequent depreciation of knowledge does not allow enough time to develop all required skills in-house. Subsequently, technological knowledge becomes a primary motive of technology acquisitions in the software industry. However, no prior study related to technology acquisitions has considered this specific industry. Restricting the empirical context to a single SIC code also allows for comparability across acquisitions and limits concerns with regard to internal validity.

Sample and Data

Through archival methods, the researcher collected data on a large number of variables that relate to acquisitions in the U.S. software industry (SIC code 7273). In all, data was collected from six different sources to test the hypotheses. Table 5 presents an overview of the data and the sources that were used.

The sample of acquisitions in the services-pre-packed software industry (SIC 7273) was obtained from the Security Data Company (SDC) Thomson Mergers and Acquisition database, a comprehensive database of financial transactions conducted by U.S. and foreign firms. Although the acquired firms were all from the serviced-pre-packed software industry, the acquiring firms may be listed with more than just the single 7273 SIC code. All 7,453 acquisitions within that SIC code for the years 2000 to 2005 were reviewed. The choice of acquisition timeframe was based on two considerations. Firstly, patent applications and approvals take approx. five years. Secondly, a dataset of recent acquisitions ensured good media coverage. The recent timeframe was also important given that the software industry changes so fast, especially with the rise of the internet, open source, and outsourcing.

This paper only includes acquisitions of U.S. based services-pre-packed software firms, as acquisitions of non-U.S. firms would present a different set of challenges for the acquisitions with regard to greater geographical and cultural distance (Morosini, Shane, and Singh 1998). The researcher used the U.S. patent database to review 7,453 acquisitions and identify the ones where the acquired firms have patents prior to acquisition. This was important in order to be able to identify the individual inventors named on the acquired firm's patents prior to acquisition. Of the 7,453 acquisitions, only 908 were related to acquired firms that had patents prior to acquisition. Those 908 acquisitions of firms with SIC code 7273 had to be reviewed in order to ensure they truly were technology acquisitions. The researcher investigated Lexis Nexis, Factiva, and other press releases or announcements referring to acquisitions. The researcher was interested in the motivation of the acquisitions and searched for phrases like "adding new technology," "new technological knowledge," "extending the current technological portfolio," or similar language. The set of 908 acquisitions was also reviewed for availability of data with regard to the Securities and Exchange Commission's (SEC) filings, which allowed the identification of financial data, company legal forms of ownership, and the location of headquarters. Based on the filtering for technology acquisitions as well as data availability, a total sample of 246 acquisitions of U.S. based services-pre-packed software firms (SIC 7273) for the years 2000 to 2005 remained. Those acquisitions accumulated a total of 1,167 patents prior to acquisition as well as 1,613 individual inventors named on those patents in total.

Measures

Table 5 lists and defines the variables used in this study; the variables are further described below.

Dependent variable. The dependent construct, retention of inventors from acquired firms, was measured in two ways. First, for each acquisition all patents made by the acquired firm prior to the acquisition announcement were identified. For each patent, all inventors that were named on the patents were identified. For each inventor's name, the U.S. patent database was reviewed in order to identify any patents the individual inventor had following the date of acquisition. Each post-acquisition patent of individual inventors from acquired firms were analyzed to determine whether or not the patents were with the acquired firm, the acquiring firm, or a third company. Based on this procedure the researcher was able to identify the individual inventors from the acquired firms that had at least one patent with the acquired or acquiring firm following acquisition. These inventors were categorized as "retained" inventors from acquired firms. The movement of the individual inventors from the acquired firms was also validated against their career moves they posted on www.LinkedIn.com, a social networking site for professionals. Approximately thirty percent of the individual inventors that were identified in the U.S. patent database had profiles in LinkedIn and posted their current and prior places of employment. An example of two individual inventors, whose employment with U.S. patent data was traced and matched with information on LinkedIn.com, is listed in the Appendix. The dependent variable is a ratio of "retained" inventors from acquired firms to the total number of inventors within the acquired firm prior to acquisition. Specifically the dependent variable expresses the level of retention of inventors from the acquired firm following the acquisition.

Second, similar to the first measure, each inventor from an acquired firm who had patents with the acquiring firm after the acquisition was identified. Acquisitions, that had at least one inventor from an acquired firm who had a patent with the acquiring firm post-acquisition, were coded one. Acquisitions that had no patents from inventors from an acquired firm post-acquisition were coded zero.

This binary dependent variable was necessary as there is a potential sample selection bias in the current analysis of retention level, retention of inventors from acquired firms. Inventors who remained with acquiring firms and continued patenting with them may have been systematically different from those who stopped patenting or left their firms all together. To address these concerns, this study uses the Heckman's two-staged model (Heckman 1979), which deals with sample selection by including a correction factor, the inverse Mills ratio. The inverse Mills ratio is calculated from the logistic regression, based on the binary dependent variable, and predicts known retained inventors (first-stage model). The outcome offers a control variable in the analysis of post-acquisition relative retention ratio of technology acquisitions (second-stage model).

Independent variables. To record prior *links* or relations between the acquired and acquiring firms' research and development areas, which allowed inventors from the acquired firms to make social connections and establish informal networks with the employees from the acquiring firm, the researcher scanned LexisNexis, Factiva, press announcements from acquiring and acquired firm, the firms' SEC filing for the 10K annual (if available), as well as 8K quarterly reports. The level of prior relationships was rated 1 when no prior research and development relations existed according to all reviewed data sources, 2 when one prior connection was mentioned, 3 when a number of prior connections were mentioned, 4 when the firms had a prior joint venture or strategic alliance, and 5 when the two firms had many close and strong relationships prior to the acquisition.

The level of *fit* or similarity between the acquired and acquiring firms was approximated by the consideration of the legal form of ownership of the acquiring and acquired firms. The researcher identified whether the acquired firm was listed in the SEC database as a publicly traded firm, which is required to file with the SEC, or if there were no filings at all, which indicated that the acquired firm a privately held company. If the acquired firm was privately held, it was assigned a value of 1, 0 otherwise. The same procedure was applied to the acquiring firm. All firms were reviewed in the SEC database. For acquiring firms with SEC filings, those firms were considered to be publicly traded and assigned a 0; the ones not listed were considered privately held and assigned a 1. Finally, for each acquisition, it was determined whether the acquired and acquiring firms were matched, that is, of the same type: either both privately held or both publicly traded. If that was the case, the acquisition was assigned a value of 1. If one was privately held and one was publicly traded, then the acquired and acquiring firms did not have the same legal form and the acquisition was assigned the value 0.

Finally, to measure the risk of personal *sacrifice* for the inventors from acquired firms with regard to specific acquisitions, the researcher identified the geographical proximity between the headquarters of the acquired and acquiring firms. The reasoning here considers that, if the headquarters of the acquired and acquiring firms are located in different U.S. states, there is a higher likelihood that, following the acquisition, inventors from the acquired firm will have to relocate to join the research and development facilities of the acquiring firm. However, the need for relocation will place inventors from acquired firms in a position of separating from their social community, friends, and potential nearby family. This independent variable was captured by identifying the location of each acquired and acquiring firm's headquarters based on the company's website, SEC filing, or Wikipedia page. The specific U.S. states were recorded for each firm and then matched based on the acquisition. If the acquired and acquiring firms were located in the same U.S. state, the number 1 was assigned, while 0 was assigned in cases where they were not located in the same U.S. state.

Control variables. The current regression model controls for factors that have been identified in prior academic work to affect the performance of technology acquisitions. A number of prior studies found that technological relatedness between acquired and acquiring firms impacts the performance of a technology acquisition (i.e., Makri, Hitt, and Lane 2010; Ahuja and Katila 2001; Puranam and Srikanth 2007). The argument of absorptive capacity (Cohen and Levinthal 1990) would suggest that integration of knowledge of the acquired and acquiring firms is enhanced if the existing knowledge base of the two firms is somewhat related. Ahuja et al. (2001) identified that if an acquisition entails knowledge that is too closely related to the acquiring firm's knowledge, the benefits might be limited. In accordance with prior work the technological relatedness between acquired and acquiring firms was calculated as the overlap between their technology codes (SIC codes) assigned to the firms by the SDC Platinum database (Puranam, Singh, and Zollo 2006; Puranam and Srikanth 2007).

A further factor that has been cited as an influence on the performance of technology acquisitions is the acquisition experience of the acquiring firm (i.e., Haleblian and Finkelstein 1999; Zollo and Singh 2004). The prior work argues that acquisition experienced technology firms are better able to manage the tension between integration and autonomy post-acquisition and consequently are able to integrate acquired firms with less negative impact on future performance (Puranam and Srikanth 2007). As used in prior studies, acquisition experience was calculated as the absolute number of acquisitions of the acquiring firm up to eight years prior to the acquisition date (Ernst and Vitt 2000).

Ahuja et al. (2001) argued that the intensity of an acquiring firm’s research and development can also have a positive impact on post-acquisition performance. An increased research and development investment within the acquiring firm can build superior absorptive capacity and enable more successful utilization of external sources of knowledge (Ahuja and Katila 2001). However, further studies predict that an acquiring firm’s research and development level does not consistently support higher acquisition performance, as it can also lead to redundant resources between the acquired and acquiring firms and diminish the value of the acquisition (Benson and Ziedonis 2009; Higgins and Rodriguez 2006). Research and development was measured in accordance with prior work as the ratio between the acquiring firm’s research and development spending and its total net sales a year prior to the acquisition (Puranam and Srikanth 2007). Finally the year of the acquisition was considered as a control variable. The years 2000 to 2005 were assigned with dummy variables from 1 to 6.

Conceptual variable	Notation	Measured variable	Description	Data source
i = acquired firm; j = acquiring firm; t = time of acquisition announcement				
Dependent variable				
Retention level of inventors from acquired firms per acquisition	$Retention_{ijt}$	Relative number of retained inventors from acquired firm	For each acquired firm all individual inventors on its patents prior to acquisition were tracked for their patent activity following the time of acquisition. If an inventor of the acquired firm had at least one patent with the acquired or acquiring firm following the acquisition he/she was counted as a retained inventor.	U.S. patent database
Retention indicator	$RetentionB_{ijt}$	Binary variable, 1 if acquiring firm had at least one post-acquisition patent from an inventor from the acquired firm, 0 otherwise	Each acquisition where at least one inventor from an acquired firm had a patent with the acquiring firm post-acquisition was coded one. An acquisition without any inventors from acquired firms' post-acquisition patent was coded zero.	U.S. patent database
Independent variables				
Prior research and development relations	R&D $relation_{ijt}$	Categories 1 to 5 pending level of prior relation	Form 1 = no prior R&D relations to 5 = many close prior R&D relations	LexisNexis, Factiva, Press announcements, SEC filings
Same type of legal company ownership	$Owner_{ijt}$	1 = same type, 0 = not same type	1 = yes, target and acquirer are both privately held or both public firms meaning target and acquirer both have SEC filings or	SEC filing

			neither have SEC filings, 0 = no, target and acquirer are not the same company form	
Geographical proximity of the acquired and acquiring firms	$Location_{ijt}$	1 = same U.S. state, 0 = not same U.S. state	1 = yes, target and acquirer are headquartered in the same U.S. state, 0 = no, target and acquirer not headquartered in the same U.S. state	SEC filing, company websites, press announcements, Wikipedia
Control variables				
Technological relatedness	SIC_{ijt}	0 = no match to 4 = all four SIC digits are the same	4 = all 4 digits of SIC code match, 3 = first 3 digits of SIC code match, 2 = first 2 of SIC code match, 1 = first SIC code matches, 0 = none of SIC codes match	SDC Platinum database
Acquirer acquisition experience	$AcqExp_{jt}$	Number of acquisitions prior to i	Absolute number of acquisitions handled by acquirer in eight years prior to this acquisition i	SEC filing, Wikipedia, press releases
Acquirer research and development intensity	$R\&D_{jt}$	Ratio of R&D to net sales for acquirer	Ratio of acquirer R&D spending (absolute R&D spending one year prior to acquisition) divided by acquirer net sales (absolute net sales one year prior to acquisition)	SEC filing
Year of acquisition	$Year_{ijt}$	Year	Year of acquisition announcement: 2000, 2001, 2002, 2003, 2004, or 2005	SDC Platinum database

Table 5: List of variables and data sources

Model specification

The objective of this study is to analyze whether the retention of inventors from acquired firms in technology acquisitions in the U.S. software industry is affected by the links these inventors had with the acquiring firm prior to the acquisition, the similarity between the two firms that the inventors might perceive, and the level of personal loss the inventors feel due to the acquisition. One dependent variable of this study, retention of inventors from acquired firms, is measured as a ratio of the number of retained inventors from an acquired firm to the total number of inventors within the acquiring firm prior to acquisition. The other dependent variable is a binary variable, assigning one to technology acquisitions where at least one inventor from the acquired firm has a patent with the acquiring firm post-acquisition, and zero otherwise. As there is a possibility that the current study entails sample selection bias in the analysis of retention level of inventors from acquired firms, this concern is addressed by the use of the Heckman's two-stage model (Heckman 1979). The two dependent variables allow a two-stage model to compensate for potential sample selection bias. The basic two-stage model can be written as:

Model 1:

$$RetentionB_{ijt} = \beta_0 + \beta_1\, SIC_{ijt} + \beta_2\, AcqExp_{jt} + \beta_3\, R\&D_{jt} + \beta_4\, Year_{ijt} + \varepsilon_{ijt}$$

Model 2:

$$Retention_{ijt} = \beta_0 + \beta_1\, R\&DRelation_{ijt} + \beta_2\, Owner_{ijt} + \beta_3\, Location_{ijt} + \beta_4\, SIC_{ijt} + \beta_5\, AcqExp_{jt} + \beta_6\, R\&D_{jt} + \beta_7\, Year_{ijt} + \beta_8\, Mills\ Ratio_{ijt} + \varepsilon_{ijt}$$

The consideration of SIC relation, acquisition experience, research and development intensity, year of acquisition, and inverse Mills ratio helps to control for alternative explanations of acquisition performance, measured here as the retention level of inventors from acquired firms in technology acquisitions.

In order to ensure the independent variables are linearly independent, the data were tested for multicollinearity. The extent of multicollinearity is tested by calculating the variance inflation factor for the ordinary least square model with the same independent variables as those in model two. The variance inflation factor for the linear regression model with robust standard error type is 1.07, well below the accepted level of 2, indicating the absence of multicollinearity.

Results

Descriptive Statistic

The sample of this study consists of 246 acquisitions of U.S. based firms in the services pre-packed software industry (SIC 7372) between the years 2000 to 2005. The acquired firms were relatively young and small, with patent applications on average no older than three years prior to acquisition; the net sales of acquired firms were on average USD 57 million, and the average number of employees was 265. In comparison, the acquiring firms were relatively well established with an average net sales in the year prior to the acquisition of USD 7,280.39 million and an average number of 23,368 employees.

With regard to the patent activity of the acquired firms, they reflect a total of 1,167 patents resulting in an average of 4.7 patents per acquired firm. Figure 9 provides an overview of the total number of inventors within the acquired firms and their post-acquisition patent activities.

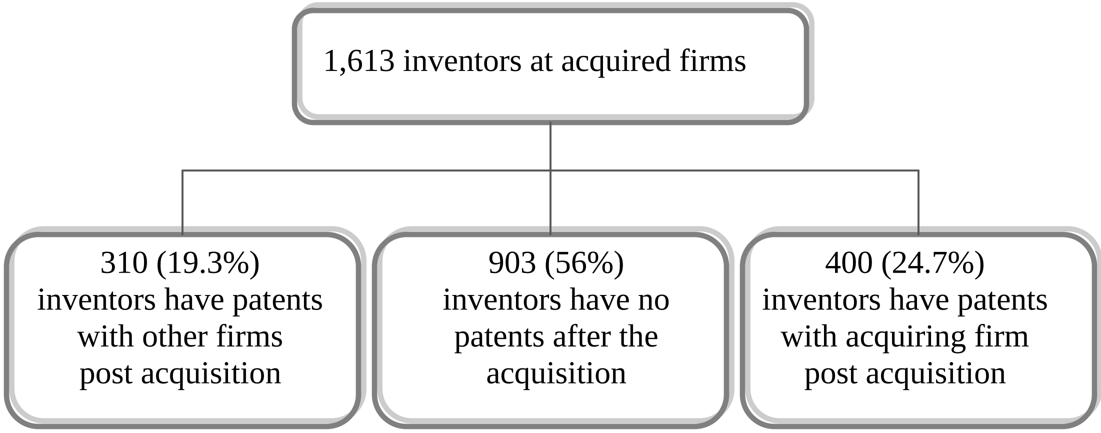


Figure 9: Post-acquisition Patenting of Inventors from Acquired Firms

The descriptive patent data reveals that almost twenty percent of inventors from acquired firms have post acquisition patent activities with third parties. Over fifty percent of the inventors from acquired firms have no patenting activity at all after the acquisition. All patent activities are based on analysis of each individual inventor in the U.S. patent database up until December 2011. Overall, less than twenty-five percent of inventors from acquired firms continued to produce patents for the acquiring firm.

Table 6 provides descriptive statistics. The table indicates the diversity of acquisitions included in the sample. Even though the sample involves only technology acquisitions of firms with SIC code 7372, there is a considerable variance on all key variables. In addition, the acquiring firms also represent a broad diversity with considerable variance among characteristics like acquisition experience or research and development intensity.

Variable	Mean	Std.Dev.	Min.	Max.
SIC_{ijt}	2.191	1.873	0	4
$AcqExp_{jt}$	14.118	20.845	0	110
$R\&D_{jt}$	0.219	0.666	0.001	10.247
$Year_{ijt}$	3.841	1.878	1	6
$R\&DRelation_{ijt}$	1.288	0.891	1	5
$Owner_{ijt}$	0.723	0.448	0	1
$Location_{ijt}$	0.374	0.484	0	1
$Retention_{ijt}$	0.245	0.358	0	1
$RetentionB_{ijt}$	0.411	0.493	0	1

Table 6: Descriptive Statistics

Table 7 provides the correlations. The variables reflecting the hypothesized effects are not highly correlated amongst themselves or with the control variables.

Variables		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	SIC_{ijt}	1.00								
2	$AcqExp_{jt}$	**-0.239**	1.00							
3	$R\&D_{jt}$	-0.053	-0.066	1.00						
4	$Year_{ijt}$	0.031	**0.278**	-0.008	1.00					
5	$R\&DRelation_{ijt}$	0.043	0.061	-0.035	**0.122**	1.00				
6	$Owner_{ijt}$	**-0.199**	0.060	-0.083	0.001	-0.055	1.00			
7	$Location_{ijt}$	0.033	-0.064	-0.029	-0.154	0.042	-0.012	1.00		
8	$Retention_{ijt}$	**-0.284**	**0.239**	-0.053	**0.173**	-0.064	**0.1970**	0.022	1.00	
9	$RetentionB_{ijt}$	**-0.249**	**0.232**	-0.065	**0.198**	-0.076	**0.109**	0.089	**0.821**	1.00

n=246

Table 7: Correlations

Hypothesis Testing

Table 8 presents the results of the two-staged model. The first model reports results for the first-stage analysis, in which the dependent variable is known as retained, a binary indicator of whether a specific acquisition had any patent applications from inventors from the acquired firm after the acquisition. Model 1 includes only the control variables. It shows that several of the control variables had significant effects. The coefficient on the technological relatedness measured in the SIC code match is negative and significant. Thus, technology acquisitions amongst firms with matching SIC codes might negatively affect the retention of inventors from acquired firms. This confirms prior results, which show that firms with too much similarity might provide inferior performance to acquisitions with moderate levels of similarity (Ahuja and Katila 2001). The coefficient for acquisition experience is positive and statistically significant, supporting prior academic work that the acquisition experience of an acquiring firm can help it manage post-acquisition integration and make it less painful to the employees from the acquired firm (Puranam, Singh, and Zollo 2006; Puranam and Srikanth 2007). The control variable for the research and development intensity of the acquiring firm is not statistically significant. This confirms prior findings from Benson et al. (2009) as well as Higgins et al. (2006), which reveal that the level of acquiring firm's research and development expenditure does not consistently predict subsequent acquisition performance. The dummy variable for the year of acquisition is positive and statistically significant.

In the second stage of analysis, the model examines the relative retention level of each technology acquisition. As noted above, this model includes the inverse Mills ratio as a control for sample selection bias (Heckman 1979). The addition of main effects of the hypothesized variables in Model 2 indicates that a prior research and development relationship between acquired and acquiring firms is positively related, however not statistically significant. It also shows that a similar ownership structure is positively related to relative retention levels of inventors from acquired firms and statistically important. Finally Model 2 also indicates that geographical distance is negatively related to relative retention of inventors from acquired firms, however not statistically significant.

Links. Hypothesis 1 predicts that in technology acquisitions the level of retention of inventors from acquired firms is affected by their links or personal connections to the acquiring firm prior to the acquisition. Specifically, the retention level of inventors from an acquired firm is higher when the acquired and acquiring firms had prior research and development relationships. However, the coefficient for prior research and development relationships is $\beta_1 = 0.0086$ ($\rho > 0.1$) is not statistically significant, rejecting hypothesis 1.

Fit. Hypothesis 2 predicts that in technology acquisitions the level of retention of inventors from acquired firms is affected by the fit or similarity between the acquired and acquiring firms. Specifically, the retention level of inventors from the acquired firm is higher when acquired and acquiring firms have similar legal forms of ownership, referring to their being either privately held or publicly traded. The coefficient for similarity of legal ownership is $\beta_2 = 0.218$ ($\rho < 0.01$). The result is statistically significant and supports hypothesis 2.

Sacrifice. Hypothesis 3 predicts that in technology acquisitions the level of retention of employees from acquired firms is affected by the level of personal loss the employees might risk with the acquisition of their company. Specifically, the retention level of inventors from the acquired firm is higher when acquired and acquiring firms are located in the same U.S. state, and, consequently, the risk of relocation might be reduced. However, the coefficient for both firms being located in the same U.S. state $\beta_3 = -0.082$ is not statistically significant ($\rho > 0.1$). The result does not support hypothesis 3.

Model	**1**	**2**
Dependent Variable	Retained inventors (yes=1, no=0)	Relative retention rate of inventors
Variables		
Inverse Mills ratio		0.368 (1.349)
Intercept	-0.449** (0.219)	-0.042 (1.508)
SIC	-0.166*** (0.046)	-.056 (0.149)
AcqExp	0.008* (0.004)	0.003 (0.006)
R&D	-0.192 (0.224)	-0.005 (0.238)
Year	0.128*** (0.048)	0.032 (0.119)
R&D Relation		0.009 (0.040)
Owner		0.217*** (0.075)
Location		-0.082 (0.061)
X^2		11.52

n=246
Std. Err. in parentheses
*p<0.10
**p<0.05
***p<0.01

Table 8: Results of Analysis for Inventor Retention

Robustness

We performed two additional robustness tests for the regression results. First, we used alternative measures for the control variables. During the first test, alternative measures for control variables were introduced. The first control variable, SIC, relates to the consideration that technological proximity between acquired and acquiring firms will increase the performance of the technological acquisition. As an alternative measure, technological relatedness was expressed as patent citations, the amount of acquiring firm pre-acquisition patents that were cited by the acquired firm's pre-acquisition patents. Next the control variable acquisition experience was replaced with a binary variable indicating one if the acquiring firm was a serial acquirer and zero otherwise. Also the research and development intensity of the acquiring firm was replaced with an alternative measure of acquiring firm patent count prior to acquisition. Finally all three alternative measures for the control variables were considered in one alternative two-stage regression, providing qualitatively similar results to the original model. Hypothesis 2 was supported while hypotheses 1 and 3 found no support.

The second robustness test provided an alternative consideration that also took the possible sample-selected bias into account. According to Breen (1996), sample-selected samples lack information on the values of dependent variables that fail to meet the criteria, and these types of analysis can be considered truncated. If one ignores the truncation of the data and simply performs a linear regression on the sample, the coefficient estimates might be both biased and inconsistent, and their values could be at some considerable distance from the known population values. However, using the log-likelihood to estimate a truncated regression model gives coefficient estimates, all of which are very close to their true values in accordance to Breen (1996). The results of the truncated regression of the main effect model 2 remain qualitatively unchanged for all key independent variables, providing support for hypothesis 2, however, rejecting hypotheses 1 and 3.

Discussion

This study attempts to understand whether knowledge workers from acquired firms, in specific inventors from acquired U.S. software firms, can be retained by their acquiring firms and whether various characteristics of technology acquisitions matter with regard to levels of retention. Drawing on the concept of a knowledge-based view of the firm and existing literature on technology acquisition, it is argued that the loss of inventors from acquired firms reflects the loss of their individual-level knowledge for acquiring firms. However, the individual knowledge of inventors from acquired firms is one of the most valuable competitive resources that acquiring firms set out to acquire in the first place.

The current sample is based on all individual inventors with pre-acquisition patents with acquired firms in the U.S. software industry (SIC 7372), specifically those firms that were acquired in the years 2000 to 2005. For each individual inventor from an acquired firm, it was analyzed whether the individual had any further patents following the date of the acquisition announcement. If following the acquisition the inventor from the acquired firm had patents with the acquiring firm or the acquired firm as a subset of the acquiring firm, the individual was considered a retained inventor. The data of 1,613 inventors from acquired firms reflects that less than a quarter of the inventors from acquired firms had patents with their acquiring firms following acquisition. In their study, Paruchuri et al. (2006) traced the survival rate of 3,933 individual inventors in the pharmaceutical industry (SIC 2834) whose companies were acquired in the years 1979 to 1994. The authors identified the patenting activity of each inventor and identified that only 1,090, or roughly twenty eight percent, of the inventors had patent activity with the acquiring firm after acquisition. The retention rate of twenty-four point eight percent in the current study appears somewhat similar to this prior data, even with both papers considering different industries as well as different time frames of acquisition.

A further consideration in the current analysis is the average rate of voluntary employee turnover in the information technology industry in the U.S. Voluntary employee turnover might be similar to the ratio of inventors from acquired firms that decided to not remain with their acquiring firms. However, the data provided by the U.S. Department of Labor's Bureau of Labor Statistics' annual reports of voluntary employee turnover by industry are far below the non-retained level of inventors from acquired firms in the current sample. With regard to the information industry, the voluntary turnover rate in 2001 was 15%, in 2002 was 13.9%, in 2003 was 14.9%, in 2004 was 17.6%, and in 2005 was 22.1%. None of these voluntary employee turnover rates in the information industry accounts for the opposite measure of limited retention rate of inventors from acquired firms of 24.8%.

In order to gain insight with regard to what factors influence the retention level of inventors from acquired firms, this study draws on the theory of employee turnover. Existing literature related to employee retention proposes that, in addition to the more traditional considerations of job satisfaction and organizational commitment, job embeddebness provides a broad constellation of influences on employee retention (Mitchell et al. 2001). Based on the three critical aspects of job embeddeness, (1) the extent to which employees have links to other people in the firm, (2) the extent to which their jobs fit with other aspects, and (3) the ease with which the links can be broken, this paper hypothesized as a first step that prior relationships between the acquired and acquiring firms would provide employees from the acquired firm with the opportunity to create informal networks and get to know people from the acquiring firm. Those existing links might ease their uncertainty about the acquiring firm, provide them with additional information about their future workplace, and make it more likely that they would remain with the acquiring firm. The results show that the level of prior research and development relationships, however, is not statistically significant in relation to the retention level of inventors from acquired firms. This might relate to the consideration that some inventors from acquired firms have established positive relationships with the research and development areas in their acquiring firms while others have had less positive experiences prior to acquisition and consequently resist employment with the acquiring firm.

With regard to similarity between the acquiring and acquired firms and whether that influences the retention level of inventors from acquired firms, this paper hypothesized that a similar corporate legal form of ownership might provide a familiar environment that inventors from acquired firms accept for future employment. Prior research identified that the type of ownership exerts direct and significant influence on corporate research and development strategy. The study by Baysinger et al. (1991) of corporate ownership and research and development strategy supports a positive relationship between institutional ownership (publicly held firms) and the level of research and development spending, as institutional investors are more concerned with the long-term performance of the firm versus private investors who might be more focused on short-term performance. Similarly, Graves (1988) confirmed a close relationship between ownership structure and research and development strategy. The current analytical results provide statistical support for hypothesis 2, that similarity in legal forms of ownership positively relates to the level of retention of inventors from acquired firms. If inventors have worked in the past in a privately owned firm, especially one with a strong emphasis on research and development, they seem to prefer in the future to work in a similar environment.

Considering the third aspect of job embeddeness, the risk of potential personal sacrifices related to the acquisition, this paper considered the risk of relocation for the inventors from the acquired firms after acquisition. Prior research identified that relocation is not necessarily an easy task for employees, as it entails separation from established communities and potential separation from family (Clark and Huang 2006). If the acquired and acquiring firms are located in different U.S. states, the acquiring firm might ask for relocation in order for the inventor to join its research facilities, which the inventor might view as a personal risk. Hypothesis 4 reflects those arguments by stating that the level of retention for inventors from acquired firms is positively related to the acquired and acquiring firms being located in the same U.S. state. However, the empirical analysis does not support the proposed relationship. This might be due to the fact that research and development facilities are not necessarily at the same location as corporate headquarters, especially for larger firms, which acquiring companies tend to be.

Potentially, the data regarding the U.S state in which the acquired and acquiring firms are located does reflect sufficiently the geographical proximity of the research facilities of acquired and acquiring firms.

Implications for Theory

This study sheds further light on technology acquisitions and their implications for success. The results support earlier findings in that technological relatedness as well as acquisition experience of the acquiring firm are statistically significant related to the success of technology acquisitions. This paper contributes to the stream of technology acquisition research by bringing in somewhat of a different perspective. Prior studies measured the success of a technology acquisitions by the innovative performance of acquiring firms following acquisition, i.e., patent count (Ahuja and Katila 2001; Puranam and Srikanth 2007), launching new products (Puranam, Singh, and Zollo 2006), or the innovative productivity of inventors from acquired firms, i.e., their patenting activity after acquisition (Kapoor and Lim 2007). However, the primary motive of technology acquisitions is to gain external knowledge. Specifically, the knowledge-based theory of firms indicates that knowledge workers and, in the case of technology acquisitions, inventors from acquired firms are an especially competitive resource. They are able to share their individual-level knowledge within the acquiring firm and thereby increase its knowledge base. However, when these inventors choose to leave the acquiring firm, they take their knowledge and competitive resources with them. This paper identifies that the level of retention of inventors form acquired firms varies amongst technology acquisitions.

The descriptive data showed that less than 25% of the inventors from acquired firms remained with acquiring firms and produced patents following the acquisition. Of course, how employees react in acquisitions can be influenced by a broad array of factors. Awareness of what can happen when a small technology-focused firm is acquired and how this is perceived by its employees can provide insights into what factors affect employees' decisions to remain with or leave an acquiring firm.

In addition, the paper also proposed factors that influence the level of retention of inventors within acquired firms. Considering prior theory on why people stay with their firms, this study showed that inventors from acquired firms are more likely to remain with their acquiring firm when the two firms are similar. Specifically, this paper indicates that similarity in legal ownership (private versus public) positively affects the retention level of inventors from acquired firms. Thus, research on technology acquisition can gain new insights related to the success and the antecedents of success for technology acquisitions.

Implications for Practice

This paper also provides practical implications for the management of technology acquisitions. Managers can consider strategic and financial perspectives of technology acquisitions, but they must also consider the human angle in order to maintain the strategic resources they aimed to acquire in the first place. Because knowledge resides to a large degree within employees, especially within knowledge workers like inventors in the software industry, those resources have to be retained in order to succeed in technology acquisitions. Knowledge workers like inventors are in high demand on the job market and at liberty to change employment. Managers need to be aware of factors within an acquisition that can positively or negatively influence individual inventors' decisions to remain with an acquiring firm. For example, this study shows that inventors from acquired firms are more likely to stay if the acquiring firm has a similar legal ownership structure as their former employee. Managers at an acquiring firm that is vastly different than the acquired firm need to be aware that extra effort and attention is required to win inventors over so that they will be more likely to remain with their new firm.

Limitations and Future Research

This study, like any, is limited in its scope and provides room for future studies. The method of archival data analysis limited the number of factors that might influence the level of retention of inventors from acquired firms. On the one hand, future studies should aim to gain further understanding of, not only firm-level factors, but also individual-level factors that affect the individual inventor's decision to remain. A qualitative study that reaches out to inventors who went through a technology acquisition and either remained or moved on to a new firm would shed even more light on the antecedents of retention on an individual level.

In addition, the current sample did not consider cross-border acquisitions. In recent years, the software industry has seen a tremendous increase in cross-border acquisitions; however, prior academic work does not inform us about the retention of inventors from acquired firms in this context. One could assume that, if the acquired and acquiring firms are from countries of vastly different cultures, this might affect an inventor's willingness to remain with the acquiring firm.

Conclusion

This study has added a new perspective of success in technology acquisitions. The knowledge-based theory of the firm posits that employees are carriers of knowledge and that knowledge is a competitive resource for the firm. Consequently, only a retained employee from the acquired firm is able to share knowledge with the acquiring firm and allow it to extend its knowledge base. This study indicates that less than a quarter of the inventors from acquired firms are retained by acquiring firms. The paper also provides evidence that the retention of knowledge workers, specifically inventors from acquired firms, is more likely for technology acquisitions amongst firms that are somewhat similar.

Appendix

Comparison of individual inventor mobility based on U.S. patent data and LinkedIn.com

Example 1: Mr. Charu Chaubal

Patent Data Information

Inventor name	Chaubal; Charu V.	
Patent No.	Date of Application	Assignee/Related firm
7,937,406	09/11/2003	Oracle
7,533,168	08/11/2003	Sun Microsystems
6,308,168	05/21/1998	Khimetrics
6,094,641	05/21/1998	Kimetrics
6,078,893	05/21/1998	Khimetrics

LinkedIn.com Information

Charu Chaubal
Group Manager, Technical Marketing at VMware
Location
San Francisco Bay Area
Industry
Computer Software
Overview
Current

- Group Manager, Technical Marketing at **VMware**

Past

- Senior Technical Marketing Manager at **VMware**
- Technical Marketing Manager at **VMware**
- Senior Architect in Data Center Technologies at **Sun Microsystems**
- Integration Engineer at **Sun Microsystems**
- Performance Engineer at **Sun Microsystems**
- Research Analyst at **Khimetrics**

Example 2: Mr. Robert (Bob) Daley

Patent Data Information

Inventor name: Robert (Bob) Daley		
Patent No.	Application date	Assignee/Related firm
7,809,366	03/21/2006	Hewlett-Packard
7,359,920	04/11/2005	Intellisync Corp
6,925,477	03/31/1998	Intellisync Corp
6,330,568	11/05/1997	Pumatech Inc.
6,044,381	09/11/1997	Pumatech Inc.

LinkedIn.com Information

Bob Daley
Chief Architect, Mobile Device Management at Hewlett-Packard
Location
Greater Boston Area
Industry
Computer Software
Overview
Past

- Chief Architect, Mobile Device Management, at **Hewlett-Packard**
- Senior Software Architect at **Bitfone Corporation**
- Architect at **Openwave**
- Software Engineer and Architect at **Pumatech**
- Software Engineer and Architect at **Intellilink**
- Software Developer and Architect at **Intellilink**
- Senior Group Manager at **Digital Equipment Corpo**

References

Agrawal, A., J.F. Jaffe, and G.N. Mandelker. 1992. "The post-merger performance of acquiring firms: A reexamination of an anomaly." *Journal of Finance* 47:1605-1621.

Ahuja, G., and R. Katila. 2001. "Technological acquisitions and the innovation performance of acquiring firms: A longitudinal study." *Strategic Management Journal* 22:197-220.

Alaranta, M. 2005. "Evaluating Success in Post-merger IS integration: A Case Study." *The Electronic Journals Information Systems Evaluation* 8:143-150.

Alavi, M., and D.E. Leidner. 2001. "Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues." *MIS Quarterly* 25:107-136.

Almeida, P., and B. Kogut. 1999. "Localization of knowledge and the mobility of engineers in regional networks." *Management Science* 45:905-917.

Argote, L., and P. Ingram. 2000. "Knowledge Transfer: A basis for competitive advantage in firms." *Organizational Behavior Human Decision Processes* 82:150-169.

Awazu, Y. 2006. "Managing technology alliances: The case for knowledge management." *International Journal of Information Management* 26:484-493.

Axelrod, R. 1997. *The complexity of cooperation: Agent-based models of competition and collaboration*. Princeton: Princeton University Press.

Badaracco, J. 1991. *The Knowledge Link; Competitive Advantage through Strategic Alliances*. Boston: Harvard Business School Press.

Barkema, H.G., and M. Schijven. 2008. "Toward unlocking the full potential of acquisitions: The role of organizational restructuring." *Academy of Management Journal* 51:696-722.

Barki, H., and A. Pinsonneault. 2005. "A Model of Organizational Integration, Implementation Effort, and Performance." *Organization Science* 16:165-179.

Barney, J. 1991. "Firm Resources and Sustained Competitive Advantage." *Journal of Management* 17:99-120.

Basili, V.R., and H.D. Rombach. 1988. "The TAME Project: Towards Improvement Oriented Software Environments." *IEEE Transactions on Software* 14:758-773.

Baysinger, B.D., R.D. Kosnik, and T.A. Turk. 1991. "Effects of board and ownership structure on corporate R&D strategy." *Academy of Management Journal* 34:205 - 214.

Becerra-Fernandez, I., and R. Sabherwal. 2001. "Organizational Knowledge Management: A Contingency Perspective." *Journal of Management Information Systems* 18:23-55.

Benbasat, I., D.K. Goldstein, and M. Mead. 1987. "The case research strategy in studies of information systems." *MIS Quarterly* 11:369-386.

Benou, G., and J. Madura. 2005. "High-tech acquisitions, firm specific characteristics and the role of investment bank advisors." *Journal of High Technology Management Research* 16:101-120.

Benson, D., and R.H. Ziedonis. 2009. "Corporate venture capital as a window on new technologies: Implications for the performance of corporate investors when acquiring startups." *Organization Science* 20:329-351.

Bharadwaj, A. 2000. "A Resource-based perspective on Information Technology Capability and Firm Performance: An Empirical Investigation." *MIS Quarterly* 24:169-196.

Birkinshaw, J. 1999. "Acquiring Intellect: Managing the Integration of knowledge-intensive Acquisitions." *Business Horizons* May-June:33-40.

Birkinshaw, J., H. Bresman, and L. Hakanson. 2000. "Managing the post-acquisition integration process: how the human integration and task integration process interact to foster value creation." *Journal of Management Studies* 37:395-423.

Bock, G.W., R.W. Zmud, and Y.G. Kim. 2005. "Behavioral intention formation in knowledge sharing: Examining the roles of extrinsic motivators, social-psychological forces, and organizational climate." *MIS Quarterly* 29:87-111.

Boehm, M., B. Nominacher, J. Faehling, J.M. Leimeister, P.W. Yetton, and H. Krcmar. 2010. "IT Challenges in M&A Transactions - The IT Carve-Out View on Divestments." Paper presented at the *International Conference Information Systems*. St. Louis, Missouri, December 12-15.

Bonoma, T. 1985. "Case Research in Marketing: Opportunities, Problems and Process. *Journal of Marketing Research"* 12:199-208.

Boot, A.W.A. 1992. "Why hang on to losers? Divestitures and takeovers." *The Journal of Finance* 47:1401-1423.

Bower, J.L. 2001. "Not All M&As Are Alike - and That Matters." *Harvard Business Review* 79:92-101.

Breen, R. 1996. *Regression Models - Censored, Sample Selected, or Truncated Data*. Edited by T. F. Liao. Vol. 111, *Quantitative Applications in the Social Sciences*. Thousand Oaks: SAGE Publications.

Bresman, H., J. Birkinshaw, and R. Nobel. 1999. "Knowledge transfer in international acquisitions." *Journal of international Business Studies* 30:439-462.

---. 2010. "Knowledge transfer in international acquisitions." *Journal of International Business Studies* 20:5-20.

Brown, C.V., G. Clancy, and R.J. Scholer. 2003. "A Post-Merger IT Integration Success Story: Sallie Mae." *MIS Quarterly Executive* 2:15-27.

Brown, S.L., and K.M. Eisenhardt. 1997. "The Art of Continuous Change: Linking Complexity Theory and Time-paced Evolution in Relentlessly Shifting Organizations." *Administrative Science Quarterly* 42:1-34.

Burton, R., and B. Obel. 1995. "The Validity of Computational Models in Organization Science: From Model Realism to Purpose of the Model." *Computational and Mathematical Organization Theory* 1:57-71.

Byrne, J.A. 1998. "The Corporation of the Future; Cisco is a good model. It reads the market well, responds quickly. And it knows how to harness high tech." *Business*

Week, August 31. Accessed February 5, 2012. http://www.businessweek.com/1998/35/b3593034.htm.

Cannella, A.A., and D.C. Hambrick. 1993. "Effect of Executive Departure on the Performance of Acquired Firms." *Strategic Management Journal* 14:137-152.

Capron, L., and M. Mitchell. 2009. "Selection capability: How capability gaps and internal social frictions affect internal and external strategic renewal." *Organization Science* 20:294-312.

Capron, L., W. Mitchell, and A. Swaminathan. 2001. "Asset Divestiture Following Horizontal Acquisitions: A Dynamic View." *Strategic Management Journal* 22:817-844.

Carley, K.M. 2002. "Computational organization science: A new frontier." *PNAS* 99:7257-7262.

---. 2008. "Computational modeling for reasoning about the social behavior of humans." *Computational and Mathematical Organization Theory* 15:47-59.

Cartwright, S., and C.L. Cooper. 1990. "The Impact of Mergers and Acquisitions on People at Work: Existing Research and Issues." *British Journal of Management* 1:65-76.

---. 1993. "Of mergers, marriage and divorce: The issues of staff retention." *Journal of Managerial Psychology* 8:7-11.

Cartwright, S., and R. Schoenberg. 2006. "Thirty Years of Merger and Acquisitions Research: Recent Advances and Future Opportunities." *British Journal of Management* 17:S1-S5.

Casal, C.C., and E.N. Fontela. 2007. "Transfer of socially complex knowledge in merger and acquisitions." *Journal of Knowledge Management* 11:58-71.

Cascorbi, A. 2003. *Demerger-Management*. Wiesbaden: Gabler.

Cassiman, B., M. Colombo, P. Garonne, and R. Veugelers. 2005. "The impact of M&A on the R&D process. An empirical analysis of the role of technological and market relatedness." *Research Policy* 34:195-220.

Charmaz, K. 2000. "Grounded theory: Objectivist and constructivist methods." In *Handbook of Qualitative Research*, edited by N. K. Denzin and Y. S. Lincoln. Thousand Oaks: SAGE Publications.

Chaudhuri, S., and B. Tabrizi. 1999. "Capturing the real value in high-tech acquisitions." *Harvard Business Review* 77:123-130.

Chiang, I.R., and V.S. Mookerjee. 2004. "A Fault Threshold Policy to Manage Software Development Projects." *Information Systems Research* 15:3-21.

Christensen, C.M., R. Alton, C. Rising, and A. Waldeck. 2011. "The New M&A Playbook." *Harvard Business Review* March:49-57.

Clark, W.A.V., and Y. Huang. 2006. "Balancing Move and Work: Women's Labor Market Exit and Entries after Family Migration." *Population, Space and Place* 12:31-44.

Coff, R.W. 1997. "Human assets and management dilemmas: Coping with hazards on the road to resource-based theory." *Academy of Management Review* 22:374-402.

Cohen, W.M., and D.A. Levinthal. 1990. "Absorptive Capacity: A new perspective on learning and innovation." *Administrative Science Quarterly* 35:128-152.

Collyer, S. 2009. "Project Management Approaches for Dynamic Environments." *International Journal of Project Management* 27:355-364.

Coury, R., and A. Wilson. 2009. "A closer look at carve-outs." *Deloitte Corporate Finance LLC.* Accessed February 27, 2012. www.investmentbanking.deloitte.com:9.

Cristo, D.A., and R.W. Falk. 2006. "Spinoffs and Carveouts: Some Factors Leading to Successful Divestiture." *Competition Forum, HighBeam Research*. Accessed March 5, 2012. http://www.highbeam.com/doc/1P3-1268524231.html.

Cross, R., and L. Baird. 2000. "Technology Is Not Enough: Improving Performance by Building Organizational Memory." *Sloan Management Review* 41:69-78.

Davis, J. P., K. M. Eisenhardt, and C. B. Bingham. 2007. "Developing Theory Through Simulation Methods." *The Academy of Management Review* 32:480-499.

Deloitte. 2012. "Divestiture planning and execution." *Deloitte.com.* Accessed March 15, 2012. http://www.deloitte.com/view/en_US/us/Services/consulting/ca8fef62bc827210VgnVCM100000ba42f00aRCRD.htm.

DeMeyer, A., C.H. Loch, and M.T. Pich. 2002. "Managing Project Uncertainty: From Variation to Chaos." *MIT Sloan Management Review* Winter:60-67.

Denton, J., and C. De Cock. 1997. "3M and Imation: Demerger as a Source of Innovation." *Creativity and Innovation Management* 6:73-88.

Donahue, K. B. 2001. "How to Ruin a Merger: Five People-Management Pitfalls to Avoid." *Harvard Management Update* 6:9-14. Accessed March 3, 2012.

http://hbr.org/product/how-to-ruin-a-merger-five-people-management-pitfal/an/U0109A-PDF-Eng?Ntt=Kristen+B.+Donahue.

Donaldson, H. 1994. "Under the microscope: personnel's role in a demerger." *Personnel Management* February:34-38.

Drucker, P.F. 1999. "The Real Meaning of the Merger Boom." *The Conference Board* Annual Essay 1999:1-6.

Du, K., and H. Tanriverdi. 2010. "The Performance Effects of Transitional IT Services in Corporate Spin-offs." Paper presented at the *International Conference Information Systems*. St. Louis, Missouri: December 12-15.

Dube, L., and G. Pare. 2003. "Rigor in Information Systems Positivist Case Research: Current Practices, Trends, and Recommendations." *MIS Quarterly* 27:597-635.

Eisenhardt, K.M. 1989. "Building Theories from Case Study Research." *Academy of Management Review* 14:532-550.

Ernst, H., and J. Vitt. 2000. "The influence of corporate acquisitions on the behavior of key inventors." *R&D Management* 30:105-119.

Faehling, J., J.M. Leimeister, P.W. Yetton, and H. Krcmar. 2009. "Managing an IT carve-out at a multi-national enterprise. A teaching case." Paper presented at the *European Conference on Information Systems*. Verona, Italy, June 8-10.

Faraj, S., and Y. Xiao. 2006. "Coordination in fast-response organizations." *Management Science* 2006:1155-1169.

Felin, T., and W. S. Hesterly. 2007. "The Knowledge-Based View, Nested Heterogeneity, and New Value Creation." *The Academy of Management Review* 32:195-218.

Frank, R. 2002. "More and More, Mergers of '90s are becoming today's spinoffs." *The Wall Street Journal online.* Accessed March 3rd 2012. http://online.wsj.com/article/0,,SB1012952590294613080.djm,1012952590294613000.html.

Giacomazzi, F., C. Panella, B. Pernici, and M. Sansoni. 1997. "Information systems integration in mergers and acquisitions: A normative model." *Information & Management* 32:289-302.

Goldblatt, H. 1999. "Cisco's secret." *Fortune* 140:4-9. Accessed February 3, 2012. http://money.cnn.com/magazine/fortune/fortune_archive/1999/11/08/268506/index.htm.

Golden, B.R. 1997. "Further remarks on retrospective accounts in organizational and strategic management research." *Academy of Management Journal* 40:1243-1252.

Gole, W.J. 2009. "A structured approach to corporate divestiture transactions." *CMA Management* 22:22-25.

Gole, W.J., and P.J. Hilger. 2008. "Managing Corporate Divesture Transactions." *Journal of Accountancy* 206:48-51.

Gould, S., and L.E. Penley. 1985. "A study of the correlates of the willingness to relocate." *The Academy of Management Journal* 28:472-478.

Graebner, M. E. 2004. "Momentum and Serendipity: How Acquired Leaders Create Value in the Integration of Technology Firms." *Strategic Management Journal* 25:751-777.

Graebner, M.E., and K.M. Eisenhardt. 2004. "The seller's side of the story: Acquisition as courtship and governance as syndicate in entrepreneurial firms." *Administrative Science Quarterly* 49:366-403.

Graebner, M.E., K.M. Eisenhardt, and P.T. Roundy. 2010. "Success and Failure in Technology Acquisitions: Lessons from Buyers and Sellers." *Academy of Management Perspectives* 24:73-92.

Granstrand, O., and S. Sjölander. 1990. "The acquisition of technology and small firms by large firms." *Journal of Economic Behavior & Organization* 13:367-386.

Grant, R.M. 1996. "Toward A Knowledge-Based Theory of the Firm." *Strategic Management Journal* 17:109-122.

Graves, S.B. 1988. "Institutional ownership and corporate R&D in computer industry." *Academy of Management Journal* 31:417-428.

Griffeth, R.W., P.W. Hom, and S. Gaertner. 2000. "A meta-analysis of antecedents and correlates of employee turnover: Update, moderator test, and research implications for the millennium." *Journal of Management* 26:463-488.

Grover, V., and T.H. Davenport. 2001. "General Perspective on Knowledge Management: Fostering a Research Agenda." *Journal of Management Information Systems* 18:5-21.

Gupta, A.K., K.G. Smith, and C.E. Shalley. 2006. "The Interplay between Exploration and Exploitation." *Academy of Management Journal* 49:693-706.

Hagedoorn, J., and G. Dysters. 2002. "External Sources of Innovative Capabilities: The Preference for Strategic Alliances or Mergers and Acquisitions." *Journal of Management Studies* 39:167-1888.

Haleblian, J., C.E. Devers, G. McNamara, M.A. Carpenter, and R.B. Davison. 2009. "Taking Stock of What we know about Mergers and Acquisitions: A Review and Research Agenda." *Journal of Management* 35:469-502.

Haleblian, J., and S. Finkelstein. 1999. "The Influence of Organizational Acquisition Experience on Acquisition Performance: A Behavioral Learning Perspective." *Administrative Science Quarterly* 44:29-31.

Harris, R. 2012. "Acquire or be acquired: CFO M&A expectations strong for mid-market tech." *CIO* February 2. Accessed March 5, 2012. http://www.cio.com/article/699344/_acquire_or_be_acquired_CFO_M_A_Expectations_Strong_for_Mid_Market_Tech.

Harrison, J. R., Z. Lin, G. R. Carroll, and K. M. Carley. 2007. "Simulation Modeling in Organizational and Management Research." *The Academy of Management Review* 32:1229-1245.

Haspeslagh, P.C., and D.B. Jemison. 1991. *Managing Acquisitions*. New York: The Free Press.

Heckman, J.J. 1979. "Sample selection bias as a specification error." *Econometrica* 47:153-162.

Hedlund, G. 1994." A model of knowledge management and the N-form corporation." *Strategic Management Journal* 15:73-91.

Henderson, P. 2006. "Why Large IT Projects Fail." Revised August 2010. Accessed February 10, 2012. http://www.ecs.soton.ac.uk/~ph/LargeIT.pdf.

Higgins, M.J., and D. Rodriguez. 2006. "The outsourcing of R&D through acquisitions in the pharmaceutical industry." *Journal of Financial Economics* 80:351-383.

Hoare, S.C., and S. Cartwright. 1997. "The human aspect of demerger: A new agenda for research?" *Leadership and Organization Development Journal* 18:194-201.

Holmqvist, M. 2003. "A Dynamic Model of Intra-and Inter-organizational Learning." *Organization Studies* 24:95-123.

Holtom, B.C., T.R. Mitchell, and T.W. Lee. 2005. "Shocks as causes of turnover: What they are and how organizations can manage them." *Human Resource Management* 44:337-352.

Hoskisson, R.E., R.A. Johnson, and D.D. Moesel. 1994. "Corporate Divestiture Intensity in Restructuring Firms: Effect of Governance, Strategy, and Performance." *Academy of Management Journal* 37:1207-1251.

Insights, Deloitte. 2012. "Fast, Furious and Focused." *Deloitte.com.* Accessed March 16, 2012. http://www.deloitte.com/view/en_US/Insights/Browse-by-Content-Type/Case-Studies/456a12f0c1798210VgnVCM200000bb42f00aRCRD.htm.

Jarrell, G.A., and A.B. Poulsen. 1989. "The returns to acquiring firms in tender offers: Evidence from 3 decades." *Financial Management* 18:12-19.

Jemison, D.B., and S.B. Sitkin. 1986. "Corporate Acquisition: A Process Perspective." *Academy of Management Review* 11:145-163.

Johnston, K.D., and P.W. Yetton. 1996. "Integrating information technology divisions in a bank merger." *Journal os Strategic Information Systems* 5:189-211.

Kane, G. C., and M. Alavi. 2007. "Information Technology and Organizational Learning: An Investigation of Exploration and Exploitation Processes." *Organization Science* 18:796-812.

Kaplan, S.N., and M.S. Weisbach. 1992. "The Success of Acquisitions: Evidence from Divestitures." *Journal of Finance* 47:107-138.

Kapoor, R., and K. Lim. 2007. "The impact of acquisitions on the productivity of inventors at semiconductor firms: A synthesis of knowledge-based and incentive-based perspectives." *Academy of Management Journal* 50:1133-1155.

Kathuria, A., A. Fontaine, and M. Prietula. 2011. "Knowledge matters, but culture is King" *SSRN eLibrary*. Accessed February 15, 2012. http://papers.ssrn.com/so13/papers.cfm?abstract_id=1626330

Keane, C. 2008. "Don't ask, don't tell: Secrets - Their use and abuse in organizations." *Journal of Management Inquiry* 17:107-112.

King, L. 2011. "ConocoPhillips drills for IT plan ahead of major business split." *Computerworld UK* July 20. Accessed March 6, 2012. http://www.computerworlduk.com/news/it-business/3292530/conocophillips-drills-for-it-plan-ahead-of-major-business-split/.

Kirchmaier, T. 2006. "Demergers - or is Divorce Attractive?" In *Handbuch Mergers&Acquisitions Management*, edited by B. W. Wirtz. Wiesbaden: Gabler.

Kogut, B., and U. Zander. 1992. "Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology." *Organization Science* 3:383-398.

Koskinen, K.U., and H. Vanharanta. 2002. "The role of tacit knowledge in innovation process of small technology companies." *International Journal of Production Economics* 80:57-64.

Kozin, M. D., and K. C. Young. 1994. "Using Acquisitions to Buy and Hone Core Competencies." *Mergers & Acquisitions* 29:21-26.

Krug, J.A. 2003. "Executive Turnover in Acquired Firms." *Journal of Management and Governance* 7:117-143.

Krug, J.A., and W.H. Hegarty. 2001. "Predicting who stays and leaves after an acquisition: A study of top managers in multinational firms." *Strategic Management Journal* 22:185-196.

Landau, J.C., B. Shamir, and M.B. Arthur. 1992. "Predictors of willingness to relocate for managerial and professional employees." *Journal of Organizational Behavior* 13:667-680.

Langley, A. 1999. "Strategies for theorizing from process data." *Academy of Management Review* 24:691-710.

Larson, J. 2004. "Anatomy of a demerger." *Workforce Management* 83:47-50.

Larsson, R., L. Bengtsson, K. Henriksson, and J. Sparks. 1998. "The inter-organizational learning dilemma: Collective knowledge development in strategic alliances." *Organization Science* 9:285-305.

Lavie, D., and L. Rosenkopf. 2006. "Balancing Exploration and Exploitation in Alliance Formation." *The Academy of Management Journal* 49:797-818.

Lee, A.S., and R.L. Baskerville. 2003. "Generalizing generalizability in information systems research." *Information Systems Research* 14:221-243.

Lee, T.W., B.C. Holtom, L.S. McDaniel, and J.W. Hill. 1999. "The Unfolding Model of Voluntary Turnover: A Replication and Extension." *Academy of Management Journal* 42:450-462.

Lee, T.W., and T.R. Mitchell. 1994. "An alternative approach: The unfolding model of voluntary employee turnover." *The Academy of Management Review* 19:51-89.

Leimeister, S., J.M. Leimeister, J. Faehling, and H. Krcmar. 2008. "Exploring Success Factors for IT carve Out Projects." Paper presented at the *European Conference on Information Systems*. Galway, Ireland, June 9-11.

Lenfle, S., and C. Loch. 2010. "How Project Management Came to Emphasize Control Over Flexibility and Novelty." *California Management Review* 53:32-55.

Leonard, D. 1995. *Wellsprings of Knowledge*. Boston: Harvard Business School Press.

Levitt, B., and J. G. March. 1988. "Organizational Learning." *Annual Review in Sociology* 14:319-338.

Liebeskind, J.P. 1997. "Keeping organizational secrets: Protective institutional mechanisms and their costs." *Industrial and Corporate Change* 6:632-663.

Liu, W. 2006. "Knowledge Exploitation, Knowledge Exploration, and Competency Trap." *Knowledge and Process Management* 13:144-161.

Liu, W., and M.R. Fehling. 2006. "A practice-based modeling and analysis of social systems: Evaluating resistance-coping strategies in mergers and acquisitions." *Simulation Modeling Practice and Theory* 14:360-384.

Lyles, M.A., and C.R. Schwenk. 1992. "Top management, strategy and organizational knowledge structures." *Journal of Management Studies* 29:155-174.

MacCormack, A., and R. Verganti. 2003. "Managing the Sources of Uncertainty: Matching Process and Context in Software Development." *Journal of Product Innovation Management* 20:217-232.

Maehring, M., and M. Keil. 2008. "Information Technology Project Escalation: A Process Model." *Decision Sciences* 39:239-272.

Maertz, C.P., and M.A. Campion. 1998. "25 years of voluntary turnover research: A review and critique." *International Review of Industrial and Organizational Psychology* 13:49-81.

Makri, M., M.A. Hitt, and P.J. Lane. 2010. "Complementary Technologies, Knowledge Relatedness, and Invention Outcomes in Technology Mergers and Acquisitions." *Strategic Management Journal* 31:602-628.

Mankins, M.C., D. Harding, and R.M. Weddingen. 2008. "How the Best Divest." *Harvard Business Review* October:92-99.

March, J. G. 1991. "Exploration and exploitation in organizational learning." *Organization Science* 2:71-87.

March, J.G., and H.A. Simon. 1958. *Organizations*. New York: John Wiley and Sons.

Markus, M.L. 2001. "Reflections on the Systems Integration Enterprise." *Business Process Management Journal* 7:1-9.

Mason, J. 2002. *Qualitative Researching*. Thousand Oaks: SAGE Publications Inc.

Mason, R.O., J.L. McKenney, and D.G. Copeland. 1997. "An historical method for MIS research: Steps and assumptions." *MIS Quarterly* 21:307-320.

McGee, M.K. 1999. "Chief of the year." *Informationweek online* December 6. Accessed March 3, 2012. http://www.informationweek.com/764/chief.htm.

McKiernan, P., and Y. Merali. 1995. "Integrating information systems after a merger." *Long Range Planning* 28:4-5.

Metha, M., and R. Hirschheim. 2004. "A Framework for Assessing IT Integration Decision-Making in Mergers and Acquisitions." Paper presented at the *Hawaii International Conference on System Sciences*, Hawaii, January 5-8.

---. 2007. "Strategic Alignment in Mergers and Acquisitions: Theorizing IS Integration Decision Making." *Journal of the Association for Information Systems* 8:143-174.

Miles, M.B., and A.M. Huberman. 1994. *Qualitative Data Analysis*. 2nd ed. Thousand Oaks: SAGE Publications.

Miller, K. D., M. Zhao, and R. J. Calantone. 2006. "Adding Interpersonal Learning and Tacit Knowledge to March's Exploration-Exploitation Model". *The Academy of Management Journal* 49:709-722.

Mitchell, T.R., B.C. Holtom, T.W. Lee, C.J. Sablynski, and M. Erez. 2001. "Why people stay: Using job embeddedness to predict voluntary turnover." *Academy of Management Journal* 44:1102-1122.

Mohr, L.B. 1982. *Explaining Organizational Behavior*. San Francisco: Jossey-Bass.

Morosini, P., S. Shane, and H. Singh. 1998. "National cultural distance and cross-border acquisition performance." *Journal of International Business Studies* 29:137-158.

Mowery, D. C., J. E. Oxley, and B. S. Silverman. 1996. "Strategic alliances and interfirm knowledge transfer." *Strategic Management Journal* 17:77-91.

Mulherin, J.H., and A.L. Boone. 2000. "Comparing acquisitions and divestitures." *Journal of Corporate Finance* 6:117-139.

Myers, M.D. 1997. "Qualitative research in information systems." *MIS Quarterly* 21:241-242.

---. 1997. "Qualitative Research in Information Systems." *MISQ Discovery.* Accessed March 3, 2012. http://www.misq.org/misqd961/isworld.

Newman, M., and D. Robey. 1992. "A Social Process Model of User-Analyst Relationships." *MIS Quarterly* June:249-266.

Nidumolu, S. 1995. "The effect of coordination and uncertainty on software project performance: Residual performance risk as an intervening variable." *Information Systems Research* 6:191-219.

Nonaka, I. 1994. "A Dynamic Theory of Organizational Knowledge Creation." *Organization Science* 5:14-37.

Norman, P.M. 2004. "Knowledge acquisition, knowledge loss, and satisfaction in high technology alliances." *Journal of Business Research* 57:610-619.

Orlikowski, W.J., and S.R. Barley. 2001. "Technology and Institutions: What can research on information technology and research on organizations learn from each other?" *MIS Quarterly* 25:145-165.

Owen, G., and T. Harrison. 1995. "Why ICI choose to demerge." *Harvard Business Review* March-April:133-142.

Paruchuri, S., A. Nerkar, and D. C. Hambrick. 2006. "Acquisition Integration and Productivity Losses in the Technical Core: Disruption of Inventors in Acquired Companies." *Organization Science* 17:545-562.

Patton, M.Q. 1990. *Qualitative Evaluation and Research Method*. 2nd ed. Newbury Park: Sage Publications.

Pearson, M. 1998. "Spin-Offs: Breaking up is hard to do." *Journal of Business Strategy* 19:31-35.

Pentland, B.T. 1999. "Building process theory with narrative: From description to explanation." *Academy of Management Journal* 24:711-724.

Perry, L.T. 1986. "Merging successfully: Sending the 'right' signals." *Sloan Management Review* 27:47-57.

Pich, M.T., C.H. Loch, and A. DeMeyer. 2002. "On Uncertainty, Ambiguity, Complexity in Project Management." *Management Science* 48:1008-1023.

Polanyi, M. 1966. *The Tacit Dimension*. New York: Anchor Day Books.

Porrini, P. 2004. "Can a previous alliance between an acquirer and a target affect acquisition performance?" *Journal of Management* 30:545-562.

Prabhu, J.C., R.K. Chandy, and M. Ellis. 2005. "The impact of acquisitions on innovation: Poison pill, placebo, or tonic?" *Journal of Marketing* 69:114-130.

Prietula, M. J., and H. S. Watson. 2000. "Extending the Cyert-March Duopoly Model: Organizational and Economic Insights." *Organization Science* 11:565-585.

Prietula, M.J., K.M. Carley, and L. Gasser. 1998. *Simulating Organizations*. Menlo Park: The MIT Press.

Puranam, P., H. Singh, and S. Chaudhuri. 2009. "Integrating Acquired Capabilities: When Structural Integration Is (Un)necessary." *Organization Science* 20:313-328.

Puranam, P., H. Singh, and M. Zollo. 2006. "Organizing for Innovation: Managing the Coordination-Autonomy Dilemma in Technology Acquisitions." *The Academy of Management Journal* 49:263-280.

Puranam, P., and K. Srikanth. 2007. "What they know vs. what they do: How acquirers leverage technology acquisitions." *Strategic Management Journal* 28:805-825.

Ragozzino, R. 2006. "Firm valuation effects of high-tech M&A: A comparison of new ventures and established firms." *Journal of High Technology Management Research* 17:85-96.

Ranft, A. L., and M. D. Lord. 2002. "Acquiring New Technologies and Capabilities: A Grounded Model of Acquisition Implementation." *Organization Science* 13:420-441.

Ranft, A.L. 2006. "Knowledge preservation and transfer during post-acquisition integration." *Advances in Mergers and Acquisitions* 5:51-67.

Ranft, A.L., and M.D. Lord. 2000. "Acquiring New Knowledge: The Role of Retaining Human Capital in Acquisitions of High-Tech Firms." *The Journal of High Technology Management Research* 11:295-319.

Repenning, N. 2002. "A simulation-based approach to understanding the dynamics of innovation implementation." *Organization Science* 13:109-127.

Rhodes, D. 2000. "Filtronic sets precedent for deal based on staff." *Electronics Times,* September 4. Accessed March 5, 2012. http://www.electronics-eetimes.comen/filtronic-sets-precedent-for-deal-based-on-staff.html.

Robey, D., and M. Newman. 1996. "Sequential Patterns in Information Systems Development: An Application of a Social Process Model." *ACM Transactions on Information Systems* 14:30-63.

Rothaermel, F.T., and D.L. Deeds. 2004. "Exploration and exploitation alliances in biotechnology: A systems of new product development." *Strategic Management Journal* 25:201-222.

Rubin, H.J., and I.S. Rubin. 2005. *Qualitative Interviewing, The Art of Hearing Data*. 2nd ed. Thousand Oaks: SAGE Publications Inc.

Sabherwal, R., and D. Robey. 1995. "Reconciling Variance and Process Strategies for Studying Information System Development." *Information System Research* 6:303-327.

Sarker, S., and S. Sarker. 2009. "Exploring Agility in Distributed Information Systems Development Teams: An Interpretive Study in an Offshoring Context." *Information System Research* 20:440-461.

Schultze, U., and D.E. Leidner. 2002. "Studying Knowledge Management in Information Systems Research: Discourses and Theoretical Assumptions." *MIS Quarterly* 26:213-242.

Schweizer, L. 2005. "Organizational Integration of Acquired Biotechnology Companies into Pharmaceutical Companies: The Need for a Hybrid Approach." *Academy of Management Journal* 48:1051-1074.

Shenhar, A.J., and D. Dvir. 1996. "Towards a typological theory of project management." *Research Policy* 25:607-632.

Shinghvi, S.S. 1984. "Divestment as Corporate Strategy." *Journal of Business Strategy* 4:85-88.

Simon, H.A. 1991. "Bounded Rationality and Organizational Learning." *Organization Science* 2:125-134.

Sitkin, S.B., K.M. Sutcliffe, and R.G. Schroeder. 1994. "Distinguishing control from learning in total quality management - A contingency perspective." *Academy of Management Review* 19:537-564.

Strauss, A. 1987. *Qualitative analysis for social scientists*. Cambridge: Cambridge University Press.

Stroh, L.K. 1999. "Does Relocation Still Benefit Corporations and Employees?" *Human Resource Management Review* 9:279-308.

Stylianou, A.C., C.J. Jeffries, and S.S. Robbins. 1996. "Corporate mergers and the problems of IS integration." *Information & Management* 31:203-213.

Tanriverdi, H. 2006. "Performance effects of information technology synergies in multibusiness firms." *Management Information Systems Quarterly* 30:57-77.

Tanriverdi, H., and K. Du. 2009. "Disintegrating Information Technology in Corporate Divestitures: Implications for Regulatory Compliance Risks and Cost." Paper presented at the *International Conference Information Systems*, Phoenix, Arizona, December 15-18.

Teece, D.J., G. Pisano, and A. Shuen. 1997. "Dynamic capabilities and strategic management." *Strategic Management Journal* 18:509-533.

Tetenbaum, T.J. 1999. "Beating the Odds of Merger & Acquisition Failure: Seven Key Practices that Improve the Chance for Expected Integration and Synergies." *Organizational Dynamics* Autumn:22-35.

Times, The Economic. 2011. "Global M&A volume marginally down to USD 2.70 trillion." *The Economic Times* December 30. Accessed March 5, 2012. http://articles.economictimes.indiatimes.com/2011-12-30/news/30573006_1_global-m-a-volume-a-a-deals-worth-usd-dealogic.

Tiwana, A., A. Bharadwaj, and V. Sambamurthy. 2003. "The antecedents of information systems development capability in firms: A knowledge integration perspective." Paper presented at the *International Conference on Information Systems*, Seattle, Washington, December 14-17.

Tiwana, A., and B. Konsynski. 2009. "Complementarities between organizational IT architecture and governance structure." *Information System Research* 21:288-304.

Urquhart, C., H. Lehmann, and M.D. Myers. 2009. "Putting the 'theory' back into grounded theory: Guidelines for grounded theory studies in information systems." *Information Systems Journal* 1365-2575:1-25.

Van de Ven, A.H., and M.S. Poole. 1995. "Explaining development and change in organizations." *Academy of Management Review* 20:510-540.

Vermeulen, F., and H. Barkema. 2001. "Learning through Acquisitions." *The Academy of Management Journal* 44:457-476.

Wadhwa, A., and S. Kotha. 2006. "Knowledge creation through external venturing: Evidence from the telecommunications equipment manufacturing industry." *Academy of Management Journal* 49:819-835.

Wallace, L., M. Keil, and A. Rai. 2004. "Understanding software project risk: a cluster analysis." *Information & Management* 42:115-125.

Walsh, J.P. 1988. "Top Management turnover following mergers and acquisitions." *Strategic Management Journal* 9:173-183.

Walsh, J.P., and G.R. Ungson. 1991. "Organizational Memory." *Academy of Management Review* 16:57-91.

Walsham, G. 2006. "Doing interpretive research." *European Journal of Information Systems* 15:320-330.

Walter, J., C. Lechner, and F. W. Kellermanns. 2007. "Knowledge transfer between and within alliance partners: Private versus collective benefits of social capital." *Journal of Business Research* 60:698-710.

Wernerfelt, B. 1984. "A resource-based view of the firm." *Strategic Management Journal* 5:171-181.

Wexler, M.N. 1987. "Conjectures on the dynamics of secrecy and the secret business." *Journal of Business Ethics* 6:469-480.

Wijnhoven, F., T. Spil, R. Stegwee, and R. Tjang. 2006. "Post-merger IT integration strategies: An IT alignment perspective." *Journal of Strategic Information Systems* 15:5-28.

Wulf, J., and H. Singh. 2011. "How do acquirers retain successful target CEOs? The role of governance." *Management Science* 57:2101-2114.

Yin, R.K. 1981. "The Case Study Crisis: Some Answers." *Administrative Science Quarterly* 26:58-65.

---. 2003. *Case Study Research: Design and Methods*. 3rd ed. Thousand Oaks, California: SAGE Publications Inc.

Zenger, T.R., and S.G. Lazzarini. 2004. "Compensation for innovation: Do small firms offer high-powered incentives that lure talent and motive effort?" *Managerial and Decision Economics* 25:329-345.

Zollo, M., and H. Singh. 2004. "Deliberate learning in corporate acquisitions: Post-acquisition strategies and integration capability in U.S. bank mergers." *Strategic Management Journal* 25:1233-1256.