Essays on the Replication of Organizational Routines: The Effect of Templates on Knowledge Transfer, the Mechanisms Underlying Knowledge Transfer Methods, and Variation Through Replication

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Essays on the Replication of Organizational Routines: The Effect of Templates on Knowledge Transfer, the Mechanisms Underlying Knowledge Transfer Methods, and Variation Through Replication

Abstract
The replication of organizational routines is at the heart of gaining competitive advantage through leveraging the most important firm resource, knowledge. This dissertation fills important gaps in the literatures on replication, knowledge transfer, and the Resource Based View by extending our understanding of the dynamics of replication in three ways. First, it empirically tests the fundamental replication hypothesis that the use of a template in the replication process increases the effectiveness of the transfer. Second, it empirically explores the dimensions underlying various transfer methods, uncovering, in the process, the primary mechanisms involved in the replication process. Finally, it empirically explores the extent, effects, and causes of variation in replicator systems, concluding that the ability to manage variation is a key strategic capability in replicator firms. Concerning the first question, the effect of template use, the dissertation finds that template use increases the effectiveness of knowledge transfer. Concerning the second question, the underlying mechanisms, it finds the primary mechanisms to be Reference and Persuasion. The dissertation validates these labels and finds that they have a differential impact on transfer difficulty depending on the stage of the transfer process in which they are applied. Concerning the third question, variation in replicator firms, the dissertation finds that replicator firms exhibit significant degrees of variation both within and between units. It also finds that adaptation of the standardized business model has a curvilinear relationship with performance with moderate degrees of adaptation positively related. However, adaptation of any degree early or late in a unit’s life is detrimental. It also finds that the most significant sources of unit level variation are differences in organizational inputs and differences in local environments. In total, the dissertation contributes to the body of knowledge concerning replication not only by filling specific gaps but suggesting that replication phenomena may be tractable to a variety of methods as all three essays are empirical in nature and use widely varying methods. Beyond the replication literature, the dissertation makes specific contributions to the larger body of literature on the Resource Based View, increasing our understanding of the dynamics of leveraging knowledge assets.

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Dedication and Acknowledgements

This dissertation is dedicated to my wife, Ann, and my children, Jennifer, Sarah, and Benjamin, who, with patience and incredible support, breathlessly awaited its completion and to Gabriel Szulanski, my mentor and friend, who has walked selflessly with me on the path of scholarship during the incubation and arrival of this work. I also wish to acknowledge and thank my dissertation committee for their contributions and tremendous advice. In alphabetical order they are Dan Levinthal, Nicolaj Siggelkow, Gabriel Szulanski, Christophe Van den Bulte, and Sidney Winter, my outstanding advisor.
ABSTRACT

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THE EFFECT OF TEMPLATES ON KNOWLEDGE TRANSFER, THE
MECHANISMS UNDERLYING KNOWLEDGE TRANSFER METHODS,
AND VARIATION THROUGH REPLICATION

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The replication of organizational routines is at the heart of gaining competitive advantage through leveraging the most important firm resource, knowledge. This dissertation fills important gaps in the literatures on replication, knowledge transfer, and the Resource Based View by extending our understanding of the dynamics of replication in three ways. First, it empirically tests the fundamental replication hypothesis that the use of a template in the replication process increases the effectiveness of the transfer. Second, it empirically explores the dimensions underlying various transfer methods, uncovering, in the process, the primary mechanisms involved in the replication process. Finally, it empirically explores the extent, effects, and causes of variation in replicator systems,
concluding that the ability to manage variation is a key strategic capability in replicator firms. Concerning the first question, the effect of template use, the dissertation finds that template use increases the effectiveness of knowledge transfer. Concerning the second question, the underlying mechanisms, it finds the primary mechanisms to be Reference and Persuasion. The dissertation validates these labels and finds that they have a differential impact on transfer difficulty depending on the stage of the transfer process in which they are applied. Concerning the third question, variation in replicator firms, the dissertation finds that replicator firms exhibit significant degrees of variation both within and between units. It also finds that adaptation of the standardized business model has a curvilinear relationship with performance with moderate adaptation positively related to performance. However, adaptation of any degree early or late in a unit’s life is detrimental. It also finds that the most significant sources of unit level variation are differences in organizational inputs and differences in local environments. In total, the dissertation contributes to the body of knowledge concerning replication not only by filling specific gaps but suggesting that replication phenomena may be tractable to a variety of methods as all three essays are empirical in nature and use widely varying methods. Beyond the replication literature, the dissertation makes specific contributions to the larger body of literature on the Resource Based View, increasing our understanding of the dynamics of leveraging knowledge assets.
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1. Theoretical Background

1.1. The Exploitation of Knowledge Assets

The resource based view of the firm, one of the dominant logics in the field of strategy, suggests that preferential access, or differential firm possession, of rare, valuable, inimitable, and non-substitutable resources is the primary determinant of firm performance heterogeneity and hence, of competitive advantage (Barney, 1991; Wernerfelt, 1984). Preferential access, a right of use that others do not have or do not have as efficiently, allows a firm to exert a measure of control over the use of critical resources, thereby forcing competitors to either pay more for the same resources or use alternative, potentially substandard, ones. Many types of strategic resources (i.e.; land and raw materials), however, are not easy to access on preferential terms with the potential value often being bargained away in strategic factor markets (Barney, 1986).

In such an environment, knowledge assets contained within the firm, and hence typically providing preferential access, are seen as fundamental sources of competitive advantage. Indeed, the ability of firms to compete has been argued to be increasingly identified with their ability to recognize such knowledge assets and exploit them within the firm (Argote & Ingram, 2000; Eisenhardt & Martin, 2000; Gupta & Govindarajan, 2000; Zander & Kogut, 1995). The importance of knowledge use both for firms and for society in general has been a long standing issue of importance in a number of disciplines including Economics (Demsetz, 1988; Hayek, 1945), Sociology (Glaser et al., 1983), Psychology (Broner et al., 2001), Philosophy (Polanyi, 1962), and Management (Nelson
& Winter, 1982; Teece et al., 1990; Winter, 1987; Zander & Kogut, 1995). The internal mobilization of knowledge assets, in particular, has increased in importance within the field of organizational studies with the rise of concepts such as organizational learning (Argote, 1999; Garvin & Oliver, 2000; Levitt & March, 1988), the knowing-doing gap (Pfeffer & Sutton, 2000), knowledge sharing (Dixon, 2000; Hansen, 1999), the internal transfer of best practices (O'Dell et al., 1998; Szulanski, 1996), and the replication of organizational routines (Winter, 1995; Winter & Szulanski, 2001, 2002).

1.2. The Replication of Routines

While many types of knowledge assets may be important for gaining and sustaining competitive advantage, Teece et al. (1997), following Nelson and Winter (1982), suggest that, due to causal ambiguity and inherent difficulty in imitating them, those most clearly contributing are embedded in organizational routines. In some industries, such as pharmaceuticals, intellectual property rights are sufficiently protected that competitive advantage often appears to flow from technology rather than routines. However, such competitive advantage is temporary without firm capabilities in R&D, distribution, etc. which allow the firm to take advantage of its technological superiority. As firm capabilities are often based on a set of organizational routines (Teece et al., 1997) which embody the firm’s productive knowledge (Nelson & Winter, 1982), coordinate relationships, connect specific resources, and allow a firm to conduct business in an ongoing fashion (Argote & Ingram, 2000; Nelson & Winter, 1982), routines become a central factor in explaining sustained competitive advantage.
While possession of superior routines, i.e.; those that produce superior performance, is a necessary condition for sustained competitive advantage it likely is not sufficient for most firms. Superior routines are often a product of a particular time and place, developed in relation to specific occurrences and personnel (Amit & Schoemaker, 1993). As such, they tend to originate in specific locations and require transfer, or replication, to other locations in order to exploit their value (Winter & Szulanski, 2002). Even if a superior routine is developed centrally through R&D rather than evolving in a particular unit it is often piloted first to prove its viability and then replicated in other units (Leonard-Barton, 1995).

1.2.1. The Value of Replication

The value of replicating routines is particularly applicable to firms with multiple units performing the same function, as superior performing routines developed in one location are likely to be applicable elsewhere. Firms with multiple similar units are commonplace including most large firms and multi-national firms that locate similar manufacturing plants, sales offices, and HR and accounting functions, etc. in different geographic locales. The value of replication is even more critical to the burgeoning sector of organizations such as franchises and chain stores which grow specifically through the geographic replication of similar units.

The value derived from replicating superior routines for a particular firm is clear if one views the firm’s overall performance as a composite of the performance of individual units as well as a premium for headquarters’ activities. Depending on the
extent of the value added by headquarters, a large part of the overall firm performance may be attributable directly to the individual units. At the very least, the performance of a firm’s units directly influences the overall efficiency of the firm, which, in highly competitive industries may well dictate the firm’s competitive position and in some cases even survival. Given the existence of similar units within a firm, the transfer, or replication, of superior routines from one unit to another may well be a primary tactic for gaining and sustaining competitive advantage (O'Dell et al., 1998).

Indeed, the leveraging of organizational routines through replication, or re-use in different geographic settings, is emerging in the strategy literature as a fundamental source of competitive advantage (Argote & Ingram, 2000; Bradach, 1998; Kostova, 1999; Rivkin, 2001; Teece et al., 1997; Winter, 1987, 1995; Winter & Szulanski, 2001). The literature on replication, however, is relatively young. While Nelson and Winter (1982) first signaled the importance of replication decades ago only a relative few have echoed that importance (e.g., Argote, 1999; Rivkin, 2001; Teece et al., 1997). Underscoring the potential value of the topic, however, are empirical studies which have indicated that units in chain organizations tend to have increased survival (Baum & Ingram, 1998) and production rates (Darr et al., 1995; Darr & Kurtzberg, 2000) due to inter-unit learning suggesting that replication is efficacious as a strategy. This is illustrated as well perhaps by the growth of repli-cator organizations in the U.S. economy over the last three to four decades. While the organizational form is relatively new it now accounts for over $1 trillion in yearly sales in the U.S., representing 40% of all retail sales (Association, 1998)
and at least 10% of the U.S. private sector economy (business format franchising alone) 
(Association, 2004). Such rapid proliferation suggests that not only is replication an 
effective strategy but that it deserves closer academic scrutiny as well.

1.2.2. The Dynamics of Replication

An understanding of the process of replication is an intrinsic part its theory, as it 
may explain how replication occurs and establish contingency factors that delineate 
between poor and superior replication, between success and failure in exploiting internal 
knowledge assets embedded in routines. Despite findings that most organizations 
struggle with the internal transfer of knowledge (Galbraith, 1990; Gupta & Govindarajan, 
2000; Ruggles, 1998), including the transfer of organizational routines (Anonymous, 
1990; Kerwin & Woodruff, 1992; Szulanski, 1996), examinations of replication 
dynamics, either theoretical or empirical, have been few and far between (Winter & 
Szulanski, 2002).

Among those who have begun to explore the dynamics of replication, however, a 
number are of particular note. Szulanski (1993; 1995b; 1996), for instance, explored 
barriers to transfers of routines. He found that the factors that contribute the greatest to 
transfer stickiness are causal ambiguity, absorptive capacity, and the relationship between 
source and receiver. Kostova and Roth (2002) echoed the findings on source/receiver 
relationships while also testing the additional role of the institutional context, finding that 
similarity in institutions tends to increase adoption and internalization of transferred 
routines. Pil and MacDuffie (1999) explored, qualitatively, how units adopting best
practices from parent Japanese auto makers both altered their environments and the practices themselves in order to achieve performance similar to the source units. Rivkin (2001), using simulations, found that increased complexity, while deterring imitation also created difficulty for replication. Szulanski again contributed by empirically investigating the stages of transfer (2000b) and by exploring the incidence of replicator capabilities developed by the headquarters of organizations that engage in repeated replication (2000a).

Winter and Szulanski, in two different articles, provide a foundation for a theory of replication (Winter & Szulanski, 2001, 2002). Their conceptualization illustrates a number of dimensions including intended vs. unintended, spatial vs. temporal, broad vs. narrow, and true vs. false replications, includes an expansion of Szulanski’s earlier work on replicator capabilities, introduces the role of the Arrow Core, and reintroduces the role of templates, the original routine used as a working example in the transfer, which was first discussed in Nelson and Winter (1982). Finally, a few others have touched upon factors that might influence intra-firm transfers of routines. For instance, both Bradach (1998) and Sorenson and Sorensen (2001) found evidence that the presence of company owned units increases adoption of routines by franchisees.1

1 There are other works such as Kogut and Zander (1992; 1993) and Zander and Kogut (1995) which may be of relevance to the transfer of organizational routines. However, most other articles dealing with intra-firm transfers of knowledge assets are specific to either technology transfers or transfers of individual level knowledge rather than transfers of routines. As Winter and Szulanski (2002) discuss, transfers of organizational routines are unique in that they involve transfers of repeated behavior which span multiple individuals, are typically causally ambiguous, and include templates. While these unique characteristics are likely to create differences in transfer dynamics future research should more clearly address the differences and the degree to which they affect transfer effectiveness.
Clearly, the initial forays into the topic have laid a fairly substantial base upon which to build including introducing a typology of replications, a temporal model of transfer stages, foundational concepts such as template and Arrow Core, and delineating a series of influential factors such as routine complexity, mutual adaptation, institutions, and the presence of barriers to transfer. Despite this base, however, much work remains to be done before the replication of organizational routines is adequately understood. For instance, the central hypothesis in the extant replication literature is that the use of templates increases the effectiveness of transferring organizational routines. This hypothesis was first introduced by Nelson and Winter (1982) and remains a central factor explaining competitive advantage between a firm and those who would imitate its superior capabilities as preferential access to a template increases the ability to replicate tacit and, potentially, causally ambiguous elements of the routine (Winter & Szulanski, 2001). To date, however, no direct test of this central hypothesis has been conducted.

Likewise, while both the broader academic and practitioner literatures on knowledge transfer have discussed various methods firms use in the transfer of organizational practices, ultimately describing dozens of such methods, there is little to no empirical understanding of the underlying purposes or mechanisms. Previous theoretical work has suggested that one such underlying mechanism is the use of original routines as a reference during the process of replication (Nelson & Winter, 1982). The existence of this mechanism as well other potential mechanisms, which understanding is a critical component of a theory of replication, remains an empirical question.
Finally, another gap in the literature is an understanding of variation in connection with replication. Typically, replication has been conceived of as a simple process entailing the repeated application of a clever routine, or set of routines, across geographic space resulting in an extreme form of exploitation commonly referred to as “cookie-cutter” strategy, i.e.; a strategy involving very little variation in similar units. Indeed, while some have argued that while the initial creation of the routines for replication involves a period of innovation and exploration (Winter & Szulanski, 2001), once that period is complete the repeated exploitation of an existing business model is argued to result in difficulties commonly associated with exploitation (Winter & Szulanski, 2001) including competency traps (Lee et al., 2003; Levinthal & March, 1993), organizational inertia (Crossan & Berdrow, 2003; March, 1991), and the inability to adapt to changing conditions (Miller, 1993).

Such a view, however, would suggest that most firms employing replication as a strategy should expand rapidly and then stagnate and decay in existing markets with new firms gaining market share at a brisk pace. Even a short survey of replicator firms and industries where replication strategy dominates suggests that while the above pattern may be true of some firms (as it is with firms employing other strategies as well) many replicator firms appear to be vibrant over long periods of time and in many representative industries there is relatively little churn among leading firms, suggesting the ability to adapt to changing environments. Given that variation, either temporal or geographic, is a necessary component of firm change such anecdotal evidence suggests the need to more
closely study the extent, effect, and causes of variation in firms employing a strategy of replication.

1.3. Overview of Essays

This brings us to the contents of the dissertation. The dissertation takes the form of three separate essays addressing the gaps identified in the previous section. Each essay will address a different gap and will include its own theoretical section reviewing the literature appropriate to that aspect of replication. In addition each essay will include its own methods section as each is empirical and based on a different dataset using different methods. Each dataset is tailored specifically to the question addressed by that essay.

The use of different datasets indicates the generalized nature of the replication concept. For instance, the first essay empirically examines three sequential transfers of sales practices to 15 European countries. The second dataset empirically explores 122 transfers of 38 administrative and technical routines to a sample of domestic and international units in all world regions within eight different firms from different industries. Finally, the third essay utilizes data derived from a large number of units from a franchise organization operating in the service sector of the U.S. economy. If, after the analyses are complete, aspects of replication are found to be significant in each of the essays one could conclude that replication occurs across different types of practices, in different countries, across various industries, and in traditional as well as franchise/chain organizations.
As the aspects of replication explored and the subsequent datasets vary so do the methods employed. The purpose and use of each method is discussed in detail in the methods section of the appropriate essay. The use of widely differing methods, however, provides some evidence as to the robustness of the general replication concept to different methods of inquiry. In brief, the methods employed include a naturally occurring, repeated treatment quasi-experiment derived from an in-depth field investigation, a multidimensional scaling and regression analysis of small N data derived from a survey, and panel data and hierarchical linear modeling analyses using a large N dataset.

The first essay directly tests the central replication hypothesis that use of templates increases transfer effectiveness, providing an empirical foundation for a theory of replication. The second essay then takes the current state of the knowledge transfer literature and examines it in a context of replication by exploring the specific methods used to replicate routines, examining underlying empirical dimensions and testing for contingency effects concerning the timing of method use. The data from both the first and second essays is derived from what Winter and Szulanski (2001) term narrow replication, or the replication of specific routines rather than an entire unit comprised of multiple, interdependent routines. Finally, the third essay addresses variation in organizations that grow through broad-based replication, or the geographic replication of entire units. This essay empirically describes the extent of variation over time in a
franchise organization, examining the extent of both inter-temporal and geographic variation and empirically explores the effects of such variation and its antecedents.
2. Template Use and the Effectiveness of Knowledge Transfer

2.1. The Advantages of Using Templates

Leveraging knowledge assets contained within the firm is deemed fundamental to realizing competitive advantage (Argote & Ingram, 2000; Eisenhardt & Martin, 2000; Gupta & Govindarajan, 2000; Levitt & March, 1988; Zander & Kogut, 1995). Teece, Pisano, and Shuen (1997), echoing Nelson and Winter (1982), suggest that the most critical knowledge assets are embedded in organizational routines. A fundamental hypothesis states that the use of templates, actual working instances of the firm's routines, increases the effectiveness of leveraging such assets through transfer (Nelson & Winter, 1982). This claim, however, has been implicitly contested to varying degrees with some claiming adherence to a template decreases performance (e.g., Kostova & Zaheer, 1999) while others suggest it has little effect (e.g., Baden-Fuller & Winter, 2006).

In this chapter, we explore the connection between template use and the effectiveness of knowledge transfer through an eight-year, real time investigation of three transfer efforts within 15 Western European countries. The setting is Rank Xerox (now Xerox Europe). Specifically, we focus on how reliance on a designated benchmark impacts the extent of adoption of transferred practices, and their performance, at the recipient site. To this effect we treat the evidence as a naturally occurring, repeated-

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2 This essay represents one stage in a multi-stage, multi-participant research project. It began with Gabriel Szulanski’s dissertation work which involved a series of companies including the focal firm here, Rank Xerox. A case study on Rank Xerox, published by INSEAD, resulted from this early work (Szulanski & Casaburi, 2004a, 2004b; Szulanski et al., 2004). Gabriel was involved during all stages of the project. I, as well as Sid Winter, became involved during the additional research conducted specifically for this essay. When published as an article it will appear as co-authored work with Gabriel Szulanski.
treatment quasi-experiment (Cook et al., 1990). The chapter provides a replicable measure of template use as well as empirical grounds to evaluate the fundamental connection between template use and knowledge transfer effectiveness.

It has been argued that firm capabilities are often based on a set of organizational routines (Teece et al., 1997) that embody an important part of a firm's productive knowledge (Nelson & Winter, 1982). Leveraging that knowledge is seen as essential to realizing competitive advantage (Zander & Kogut, 1995). Leveraging such knowledge, as Teece et al. (1997) argue, often entails re-using it in a different setting. Not only does it make economic sense for a firm to leverage superior routines by re-using, or copying, them rather than re-creating them de novo\(^3\) in each new setting, it makes sense to do so before the firm's competition does (Nelson & Winter, 1982; Rivkin, 2000; Teece et al., 1997). A firm has an inherent advantage over potential imitators in re-using its own routines because it generally has privileged access to them (Winter, 1995). In replicating a routine the firm possessing it can directly observe it in its totality. An imitator, in most cases, cannot directly observe the entire routine being copied, creating a distinct disadvantage in being able to copy the less observable, yet potentially still essential, aspects of the routine\(^4\).

\(^3\) The replication of organizational routines may not be desirable in all locations as varying environmental conditions may change the key success factors of any given routine. However, evidence suggests the advantage of leveraging capabilities via replication of successful routines tends to persist despite widely varying environmental conditions (Ingram & Baum, 1997; Szulanski & Jensen, 2006)

\(^4\) It should be noted that the replication of organizational routines may not necessarily lead to an increase in performance. While we are arguing that the use of templates may increase the effectiveness of knowledge transfer it is possible that firms could replicate routines which achieve sub standard results. A successful transfer in this regard may be effective but result in lower recipient unit performance.
Nelson and Winter (1982) use the term template to designate working examples of organizational routines. Such templates contain the critical aspects of the routine, along with the non-critical ones, providing the details and nuances of how the work gets done, in what sequence, and how its various components and subroutines are interconnected. Scrutiny of the template allows not only for an examination of factors that may not be publicly available outside the firm but may also increase the likelihood that aspects of the routine that are tacit (Polanyi, 1962) or causally ambiguous (Lippman & Rumelt, 1982) are nonetheless transferred. Because the leveraging of knowledge assets through the replication of firm routines involves the recreation of productive knowledge from the source site, it follows that use of the original routine as a template may facilitate the transfer of knowledge within the firm.

This claim, however, has been implicitly contested to varying degrees. For instance, International Business scholars suggest that actual insistence on adhering too close to a template decreases transfer effectiveness by inhibiting local adaptation (Bartlett & Ghoshal, 1989; Prahalad & Doz, 1987) and increasing local resistance (Kostova & Zaheer, 1999). Baden-Fuller and Winter (2006) offer two suggestive examples of situations where transfer by principle seems superior to transfer by template. Rivkin (2001) is skeptical about the possibility of deriving competitive advantage from the reproduction of complex knowledge regardless of whether or not a template is used, only allowing for the possibility of competitive advantage being derived from moderately
complex knowledge, knowledge simple enough to achieve comparable results without having to resort to the original template for diagnosis.

Notwithstanding the potential practical and theoretical importance of templates for realizing competitive advantage, systematic empirical evidence of the effect of templates is scarce. Perhaps of special concern is the effective absence of an accepted measure of template use.

2.2. Setting

To empirically examine the hypothesis that the use of templates increases the effectiveness of knowledge transfer we report a case study that includes a repeated-treatment quasi-experiment that occurred naturally at the Western European units of Rank Xerox. Under substantial pressure from Xerox headquarters to increase financial performance, in September 1992 Bernard Fournier, then CEO, launched a series of initiatives to increase revenue by identifying, documenting, and transferring best practices associated with sales and marketing processes. The initiative was headed by a team of managers known internally as “Team C.”

While the first initiative, referred to as Wave I (launched early 1994), proved successful, the launch of the second initiative, referred to as Wave II (late Autumn 1994), stalled. The third initiative, Wave III, referred to internally as Telesales (pilot units implemented-Autumn 1995, general implementation-Jan. 1996), was again successful. The period of investigation is from 1992 to 1999.
2.3. Data Collection

We followed Yin (1989) during the initial data collection, employing, during this stage of the research, a descriptive case study methodology aimed at accurately describing the three transfers. This stage of the data collection occurred in real time, over the entire eight year period. Full access was granted to us by the company. Team C’s leader, Carlos Camarero, acted as host and main informant throughout the entire period. Camarero facilitated access to all members of Team C as well as with senior managers of many of the country business units (CBUs). We visited headquarters at least once a year and several CBUs before, during, and after selected interventions and had access to individuals and internal company documents as required to clarify ongoing findings. Data on each “wave” was collected from multiple data sources including interviews, direct observation, company documentation, a survey, and archival data.

Following the initial data collection, once members of Team C had approved our depiction of events, we published a set of case studies detailing the three waves. At this point we recognized that the data comprised a naturally occurring, repeated treatment quasi-experiment following the methodology developed by Cook and Campbell (1979), allowing us to test the longstanding and fundamental hypothesis of template use. With a firm hypothesis in mind we then re-approached our sources to collect additional data on the independent variable, template use. We collected additional firm archival data consisting of every document the firm still possessed concerning Team C (nearly 5000 documents) and utilized semi-structured interviews to focus on the role of templates,
internally referred to as benchmark units, in the knowledge transfer process. Further iterations back to the data sources were conducted in order to gather additional information as necessary to address alternative explanations as they emerged. The following two sections detail how we measured the two most critical variables, the use of templates and the effectiveness of the knowledge transfer.

### 2.3.1. Template Use

In accordance with the definition of template offered earlier, a replication initiative is said to have used a template when the practice, or routine, being replicated is currently in existence, is composed of a single or connected series of processes, is observable, and is consciously used in the replication process. A template is seen as not being in use if any of the above are missing i.e.; the practice is either dormant or is still an idea and has not been implemented yet (is not currently observable), the practice consists of multiple, unconnected pieces (removing the possibility of observing the interconnections between the subroutines), or the practice exists but is ignored during replication. In this particular chapter the use of a template is recognized by the designation of benchmark countries that possess the particular routine being transferred and that are explicitly used during replication.

### 2.3.2. The Effectiveness of Knowledge Transfer

We utilize two measures of knowledge transfer effectiveness in this chapter. First, we measure the level of adoption of each initiative by the recipient units. This measure includes both the number of recipient units adopting the initiative as well as the
level of implementation at each site. Level of implementation within a particular unit can be affected by other variables such as difficulty of transfer but also reflects the level of effort put forth by the recipient. Adoption is a suitable preliminary measure of the effectiveness of knowledge transfer as knowledge does not transfer at all if a recipient unit does not undertake implementation of the routine in question. Level of implementation was measured through internal company assessments of implementation efforts which were jointly determined by headquarters and the recipient units. These assessments were taken a year after implementation efforts began for each transfer initiative.

Second, we measured the performance of the recipient units following implementation of the transferred routine. If one assumes, as is the case with each template in this chapter, that the routine being transferred was achieving superior results compared to the routines previously in operation at recipient units, one should expect to see an increase in performance in the recipient units along the dimensions critical to the routine in question. As such, pre and post transfer measures of recipient unit performance are a good gauge as to the effectiveness of the knowledge transfer effort. Performance is measured using available quantitative indicators which included sales force productivity, sales force coverage of potential customers, and the ratio of selling costs to revenue.
2.4. Analysis of the Effectiveness of Template Use

What follows is a description of the practices and the process used to transfer them. The description of each wave is followed by a discussion of the results of the measurement of the template and effectiveness variables for that wave.

2.4.1. Wave I

The first wave of the Team C initiatives (Wave I) began in 1993 with the practices being presented for implementation in early 1994. For Wave I, Team C searched for current, discrete best practices that could be relatively easily transferred and implemented separately from one another. These best practices would be transferred to other countries, with the originating country designated as the benchmark that others could consult and emulate.

Of a total of 40 identified best practices, Team C selected 10 which were then validated in-situ to ensure that they, in reality, produced superior results and were potentially transferable. The team emerged from this effort with nine validated best practices for revenue growth\(^5\). Top management dictated that each country fully implement at least four of the nine.

Team C spent considerable time with each practice analyzing the key success factors underlying the superior results, eventually reducing them to a manageable number of factors that could be easily implemented. They prepared and distributed an implementation manual written in easy-to-understand language. The manual first

\(^5\) For a description of the Wave I practices please see the original case study (Szulanski, Deutsch, Fuego, and Casaburi, 2003).
presented the data showing the differences in performance between the benchmark practices and those in other countries and then detailed the key success factors underlying the practices and how to implement them. The book also included contact information for each benchmark site so that recipient units could contact key people for help in implementing each practice. Following distribution of the manuals, Team C leaders visited each of the recipient countries multiple times to monitor implementation progress and help with any emerging problems.

According to the definition of a template as an organizational routine comprising a connected set of processes that are functioning, recurrent sets of behaviors, Wave I clearly used a template, or rather a set of templates. The nine practices were distinct, separate sales practices, each currently in operation within a particular country unit which was then specified as a benchmark unit and actively used to transfer the practice.

Adoption of Wave I practices was high. The countries were only required to implement four of the nine practices in order to reach internal implementation targets. All fifteen countries involved with the transfers met the goal of implementing completely at least four practices within one year. Many implemented more. Table 1 shows the extent of implementation by practice.
### Table 1: Extent of Wave I Adoption by Practice Where Data Available

<table>
<thead>
<tr>
<th>Practice</th>
<th>Average</th>
<th>UK Jan '95</th>
<th>Germany Sept '95</th>
<th>Switzerland Dec '95</th>
<th>Austria June '95</th>
<th>Spain Nov '95</th>
<th>Nordic Sept '95</th>
</tr>
</thead>
<tbody>
<tr>
<td>Majestik</td>
<td>3.8</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Customer Retention</td>
<td>3.7</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Docutech</td>
<td>3.8</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>DocuPrint</td>
<td>3.5</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>New Major Accounts</td>
<td>3.8</td>
<td>5</td>
<td>-</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Comp. MIF</td>
<td>3.2</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Analyst Time Billing</td>
<td>3.7</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>CEP</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>XBS</td>
<td>4.2</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>% Target Achieved (4 practices)</td>
<td></td>
<td>100%</td>
<td>150%</td>
<td>150%</td>
<td>175%</td>
<td>175%</td>
<td>100%</td>
</tr>
</tbody>
</table>

*Rated on a scale of 1-5 with 1=no implementation, 2=planned implementation, 3=partially implemented with major work still required for full implementation, 4=implemented with minor work still required for full implementation, 5=completely implemented. Concerning % target achieved Rank Xerox considers 4s and 5s to indicate a practice having been implemented.

*All 15 Rank Xerox European countries implemented at least four practices. Implementation data by practice is only available for nine.

*Nordic is the average for the geographic region comprising Sweden, Norway, Finland, and Denmark.

Not only was Wave I well implemented but the transferred practices performed strongly in the recipient units. Overall, Wave I replicas generated over $100M in additional revenue in 1994 and nearly another $100M in 1995, far outpacing initial expectations. An example of performance gains was the increase in unit sales of color copiers due to the transferred Wave I practices. Within one year of implementation Switzerland was selling 328% more, Netherlands 300%, and Norway 152% more (Stewart, 1996). Every transferred practice generated a substantial increase in revenue beyond the costs of implementation, which were approximately $1 million total, with the
average revenue increase exceeding the firm target by 154%\(^6\). Table 2 indicates the aggregate revenue gains attributable to each of the nine practices. Such increases in performance helped increase the average revenue per sales person from $368,000 in 1993 to $400,000 by the end of 1994 (statistically significant at the \(p=.02\) level).

<table>
<thead>
<tr>
<th>Table 2: Extent of Wave I Success by Initiative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiative</td>
</tr>
<tr>
<td>MajestiK</td>
</tr>
<tr>
<td>Customer Retention</td>
</tr>
<tr>
<td>DocuTech</td>
</tr>
<tr>
<td>New Business Major Accounts</td>
</tr>
<tr>
<td>DocuPrint</td>
</tr>
<tr>
<td>Competitive MIF Identification</td>
</tr>
<tr>
<td>Analyst Time Billing</td>
</tr>
<tr>
<td>Second Hand Centralized Printers</td>
</tr>
<tr>
<td>XBS</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Cumulative Total through 1995</td>
</tr>
</tbody>
</table>

2.4.2. Wave II

Inspired by the dramatic results of Wave I, beginning in the second half of 1994 Team C decided to escalate the exploitation of existing practices to a more sophisticated level by defining an overarching best practice for the company's entire sales process. At the core of the Wave II initiative was the idea of increasing salesperson coverage of potential customers. Traditionally, Rank Xerox had rewarded sales people based on the number of copiers sold per month. However, this led most sales people to focus their

\(^6\) While, other than that which is listed here, we do not have evidence of a direct link between Wave I and the additional revenue the Rank Xerox management at the time, which did have data on the direct link, attributed the additional revenue to implementation of the Wave I initiative.
efforts on selling to current customers who were about to upgrade or replace existing
equipment rather than focusing on prospecting potential customers. This tactic typically
ensured the sales people adequate sales per month but did not expand Rank Xerox’s
market share which was only at approximately 15% in the European market. Internal
data, with the data adjusted for market size and photocopying volume, showed that
countries which focused more heavily on covering potential customers were substantially
more productive. Team C concluded that an overarching best sales practice focused on
coverage could potentially triple the gains made with Wave I.

Measuring sales productivity by the coverage of prospective customers instead of
the number of copiers sold, however, entailed a basic shift that would alter not only how
sales activity was measured but daily sales person behaviors and how the CBUs were
assessed. Shifting the focus to coverage required changing more than just the incentive
structure. A focus on coverage also required better territory planning and more intensive
use of databases in order to track prospects and ensure that sales people were contacting
those who were about to replace equipment and who would potentially purchase enough
to make the call worthwhile. Likewise the targeting, lead generation, activity planning,
reporting, monitoring, and training had to be shifted to support the new focus. All total,
nine different interdependent activities, or sub-processes, had to be changed to adequately
support a strong focus on coverage.

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*A few countries, such as Spain and Portugal, already had practices in place which emphasized some
degree of coverage. However, none of the existing practices, in the eyes of Team C, went far enough.*
In an effort to replicate the success of Wave I by again re-using internal knowledge assets, Team C analyzed each of the countries looking for best practices that corresponded with the individual sub-processes, finding these scattered randomly throughout the countries. The assembly of the best-in-breed sales sub-processes resulted in a composite process which, in essence, detailed new action plans for each aspect of the Rank Xerox sales process. The different sub-processes were considered separate but serial, and highly interdependent, modules which, when combined, comprised the new sales model called the "Sales Force Management Activities Model."

As with Wave I, an extensive book was then produced which detailed the superior performance of the sub-processes, or modules, at the countries where they were currently in operation and included key success factors and steps for implementing each sub-process. The book was written in easy to understand language but also in excruciating detail and carefully described the plan for combining the modules into a coherent, complete new sales process. Once the book was ready it was personally presented to the management teams of each of the CBUs by Team C leadership in a series of "road shows" meant to increase motivation for implementing the new practice. As with Wave I, Team C traveled extensively during the implementation process in order to monitor progress and to encourage and help the countries overcome implementation problems.

Unlike Wave I, Wave II did not have a template to use. The definition of a template requires that a practice be composed of a single or interconnected series of practices that are currently in use. The practices that were being replicated, while
existing in separate business units, did not exist as a unified, functioning whole in any location. The model that unified them into a single routine was only a conceptual model and had never been in use before. The news sales process had not been tested, was not in operation, and therefore had no results to prove its viability. Ricardo Morais, a Team C member explains, “We tried to do something ideal but totally logical. But that thing, with those pieces, never existed [before] in that way.”

Also unlike Wave I, despite the potential for tremendous increases in revenue, adoption of the new sales practice was low. Despite significant upper management support, including a policy change to determine bonuses partly on implementation of Wave II, few of the countries significantly adopted the practice. Some countries openly refused, but most feigned enthusiasm while only giving implementation a token effort\(^8\). Moreover, average sales force coverage, the key metric for Wave II, remained static and sales force productivity actually declined. Within a year of launch the CEO declared the project dead and the CBUs ceased even outward attempts to implement the project.

Of course, there was at least partial implementation of the new practice in many locations. However, the new sales practice consisted of a series of nine interdependent modules. For the practice to operate effectively all nine modules had to be implemented satisfactorily. Over one year into the implementation effort only one country, Greece, had sufficiently implemented more than 2/3 of the modules necessary to operate the Wave II practice. The average level of implementation was under 40%. Furthermore,

\(^8\) This is similar to Zbaracki’s (1998) work on TQM where managers often engaged in rhetoric that was often not followed by legitimate implementation of the practice.
regarding those who had reported full implementation of Wave II modules, upper management suspected that many had not actually done so. Instead, it was strongly suspected that in an effort to placate top management they had implemented cosmetic changes only without making the fundamental changes necessary to fully implement the modules. For instance a year into the implementation process, despite self-reports showing moderate levels of implementation, only 10% of the salespeople were actually using the database software central to Wave II success.

Table 3 shows the color-coded implementation self-reports submitted approximately a year after the Wave II launch. Red indicates there are critical problems with the implementation. Yellow indicates that significant improvement is required before the practice can be considered to have been implemented. Green indicates that implementation is progressing satisfactorily. The figures in the table represent the number of modules in each color category. A full year into the implementation process most countries had not made much progress.
Table 3: Extent of Wave II Adoption

<table>
<thead>
<tr>
<th>Country</th>
<th># of Red</th>
<th># of Yellow</th>
<th># of Green</th>
<th>% Green</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>22%</td>
</tr>
<tr>
<td>Belgium</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>56%</td>
</tr>
<tr>
<td>Denmark</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>66%</td>
</tr>
<tr>
<td>Finland</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>66%</td>
</tr>
<tr>
<td>France</td>
<td>0</td>
<td>7</td>
<td>2</td>
<td>22%</td>
</tr>
<tr>
<td>Germany</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>22%</td>
</tr>
<tr>
<td>Greece</td>
<td>0</td>
<td>2</td>
<td>7</td>
<td>78%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>56%</td>
</tr>
<tr>
<td>Italy</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>22%</td>
</tr>
<tr>
<td>Norway</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>22%</td>
</tr>
<tr>
<td>Portugal</td>
<td>0</td>
<td>3</td>
<td>6</td>
<td>66%</td>
</tr>
<tr>
<td>Spain</td>
<td>8</td>
<td>0</td>
<td>1</td>
<td>11%</td>
</tr>
<tr>
<td>Sweden</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>11%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>56%</td>
</tr>
<tr>
<td>UK</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>11%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>52</strong></td>
<td><strong>53</strong></td>
<td><strong>39%</strong></td>
</tr>
</tbody>
</table>

2.4.3. Wave III - Telesales

During Wave II, on a separate assignment, the CEO suggested to Camarero, the head of Team C, that he visit the Rank Xerox operations in Dubai, United Arab Emirates. There, since 1993, the salespeople had contacted customers mostly by phone, primarily to escape typical temperatures that exceed 44 degree Celsius, rather than face-to-face as they did in Europe. The results were extraordinary. In late 1994 Camarero visited Dubai to personally observe the operations. He was impressed with the results and, as implementation of Wave II began to falter in 1995, he decided to analyze it further. In his examination of the Telesales practice he discovered that it accomplished almost exactly what he was trying to do with Wave II and in many of the same ways. Indeed the Telesales practice in Dubai focused on coverage and incorporated all nine of the interdependent sub-modules of Wave II with the exception that three were embedded in a
piece of software. Indeed, through the use of the telephone as the primary mechanism for customer contacts the results were even better than expected with Wave II. As Camarero explained,

“We found out that [in Europe] our salespeople were averaging ten customer visits a day, but only one of them was effective. This way (i.e.; using Telesales) they could rapidly complete the effective transaction and had plenty of time left to average 2.5 effective transactions per day, thus doubling their productivity.”

Camarero decided to transfer the Telesales practice to the Western European countries to restore the momentum lost in Wave II. Following the same method used in Wave I and Wave II he extracted the key elements of the Dubai practice. He then put together a book similar to that used in both waves detailing the extraordinary performance of Dubai, describing the key factors of the Telesales practice, and explaining how to implement it.

The management in Dubai had embedded the elements having to do with database management, reporting, and record keeping in a piece of software entitled TeleMagic, making integration of those three aspects of the sales process relatively easy. Team C considered the IT aspect of the project to be an important enabler. As one Team C member, Ricardo Morais, suggested, however, he never would have been able to use IT as an effective enabler for the project if Dubai had not already been using TeleMagic. Not only did Dubai’s use of TeleMagic provide the initial impetus for the use of IT (the understanding that one could use such software, which was commercially available, to sell large copy machines by telephone), it also provided the understanding of how to
successfully connect the software with the less technological aspects of the practice. The key success factors, while including IT, referred to all nine interdependent sub-processes and Dubai was used as a referent multiple times to solve non-IT related implementation problems.

For example, after implementation had been under way for a couple of months they discovered that they didn’t know how to operate Telesales for salesmen responsible for Key Accounts with major corporations. It didn’t seem to make sense to approach large firms by telephone for sales often totaling tens of thousands of dollars. In response, Camarero returned to Dubai. In Dubai those responsible for Key Accounts used the telephone as much or more than those responsible for smaller firms because the units of large corporations often buy separately and are headed by people who are too busy for numerous personal visits.

The Telesales initiative was initially implemented in late 1995 in a series of pilot implementations beginning in Lisbon, Birmingham, Lyon, Brussels, and Madrid. To persuade the managers of these units to undertake the initiative, Camarero not only shared with them data proving the superior performance of Dubai but he flew them to Dubai personally to observe the practice in operation. The Telesales practice was considerably more complex than the practices transferred in Wave I in that, like Wave II, it involved a fundamental re-structuring of the sales force management process that rested on a series of interdependent modules, or sub-processes. As a consequence, implementation was not quite as smooth as Wave I. It took a number of months for the
pilot units to begin to reproduce the superior results found at Dubai along with a number of iterations back to Dubai to answer questions that were originally unforeseen.

After a few months, however, the transferred practice achieved comparable results and the pilot units were designated as benchmarks for the rest of the corporation. As he had in persuading the pilots, Camarero brought hundreds of managers to the pilot in Lisbon to personally observe the operations in an explicit attempt to increase the motivation to adopt the new practice. In his view Telesales materialized the theoretical model of Wave II.

"It was an opportunistic exercise where theory turned into practice. It allowed potential recipients to see, eat, chew and touch the practice. It was seeing with their own eyes that 2+2=4, not just being told."

Fulfilling the requirements of a template, the Telesales practice was, at the time of the transfer, currently and consistently in operation as a functioning complete practice in Dubai, the United Arab Emirates. It was not a set of discrete, independent practices as in Wave I, but, unlike Wave II, the interdependent sub-practices in Telesales were in operation as a combined whole. As with Wave I, both adoption and performance were high. Within six months of launch the initiative had been fully implemented in all 15 Rank Xerox Western European countries. The Chairman’s Statement in Rank Xerox’s 1996 Annual Report noted that Telesales significantly improved sales coverage (a key Telesales metric) and increased market share. Within a year of implementation average sales coverage had increased by 11% with some units increasing as much as 30%
(significant at the $p=.01$ level when lagged to allow for issues of incomplete data for 1996). Sales productivity rose accordingly (significant at $p<.001$ level) while the ratio of gross profit to sales expense doubled (significant at $p<.001$ level) without a significant loss of customers that might be expected if the practice only represented short term sales at the expense of long term customer relations\(^9\).

2.5. **Analysis of the Evidence**

Table 4 compares key performance metrics for pre and post implementation of the three waves. The comparison highlights the conclusion that Wave II was not successful while the other two initiatives were. Given the size and complexity of the Telesales initiatives we include the key metrics lagged one year as well. While technically one would expect the same lagged effect for Wave II the lack of implementation forestalls any such effect. Because relatively few, if any, implemented Wave II to any great degree the effects seen in 1996 and 1997 can safely be ascribed to Telesales which was fully implemented within 6 months of launch. T statistics comparing the means of the 15 major Rank Xerox European countries across time periods as well as $p$ values are reported below the metric where available.

---

\(^9\) They did experience a 1% decline in customer loyalty but within the firm it was attributed to downsizing and high year to year fluctuations of customer loyalty in the industry as a whole.
Table 4: Comparison of Wave I, Wave II, and Telesales Performance

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Sales Coverage^a</td>
<td>Not applicable</td>
<td>29.14</td>
<td>29.14</td>
<td>32.36</td>
<td>33.11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(t 0.00, not sig.)</td>
<td>(t 2.07, p&lt;.10)</td>
<td>(t 3.70, p&lt;.01)</td>
</tr>
<tr>
<td>Mean Sales Coverage vs. 1994^b</td>
<td>Not applicable</td>
<td>30.53</td>
<td>Not Applicable</td>
<td>33.01</td>
<td>33.89</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(t 2.50, p&lt;.05)</td>
<td>(t 2.53, p&lt;.05)</td>
</tr>
<tr>
<td>Mean Direct Sales Revenue/sales person ($k)^c</td>
<td>368</td>
<td>400</td>
<td>385</td>
<td>452</td>
<td>481</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(t 2.50, p=.05)</td>
<td>(t 1.36, not sig.)</td>
<td>(Not available)</td>
<td>(t 4.74, p&lt;.001)</td>
</tr>
<tr>
<td>Mean Ratio of gross profit to selling expenses</td>
<td>Not available</td>
<td>1.06</td>
<td>1.19</td>
<td>Not available</td>
<td>2.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Not available)</td>
<td>(t 2.82, p&lt;.01)</td>
<td></td>
<td>(t 7.89, p&lt;.001)</td>
</tr>
</tbody>
</table>

^a1995 sales coverage data were available only by geographic region (Northern, Southern, and Central) except for the three largest countries (Germany, France, and the U.K) for a total sample size of 7. In order to make comparisons with other periods similar aggregate means are computed for geographic areas in other periods as well.

^bComparisons for 1994 vs. 1996 and 1994 vs. 1997 include data for each country involved in the transfer effort, rather than regional aggregates, for a total sample size of 15.

^cData for 1996 direct sales revenue is available only in aggregate form, not broken down by country.

Overlaying the patterns of template use, adoption and performance discussed above produces the following:

Table 5: Correlation between Template Use and Knowledge Transfer Effectiveness

<table>
<thead>
<tr>
<th>Adoption Performance</th>
<th>Wave I</th>
<th>Wave II</th>
<th>Telesales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Template Used?</td>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Successful</td>
<td>Unsuccessful</td>
<td>Successful</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

All available indications suggest a clear correlation between template use and the effectiveness of the knowledge transfer efforts.
To further our analysis of the evidence we treat it as a naturally occurring, repeated-treatment quasi-experiment. We do so to assess the extent to which the evidence might be supportive of the basic claim that template use actually enhances the effectiveness of the transfer, i.e.; to assess the degree to which the data may be suggesting a causal relationship (Cook & Campbell, 1979).

Such an approach is applicable to situations when there is only one population and where the treatment is applied, removed, and applied again to the entire population (Cook et al., 1990). While the researcher is not expected to have control over the incidence of the treatment, he/she is expected to have rich access to data and exact knowledge of when the treatment occurred (Cook, 1991). The specific design is known as a repeated-treatment quasi-experiment (Shadish et al., 2001) or repeated-measures design (see Barlow and Hersen 1984 for an application in psychology; Trochim, 2001)\(^\text{10}\). The quasi-experimental nature of the design increases the need to carefully weigh potential alternative explanations.

The explanatory power of the design, which is depicted below, is enhanced by the repeated incidence of the treatment. X indicates application of the treatment while /X indicates its removal. The most interpretable outcome occurs when O\(_1\) (the first observation) differs from O\(_2\), O\(_3\) differs from O\(_4\), and the O\(_3\)-O\(_4\) difference is in the same direction as the O\(_1\)-O\(_2\) difference.

\(^{10}\) While we have portrayed the experiment as a set of three waves, indicating an N of three, the data actually comprises a set of 15 countries across those three waves. This extends the observations across additional units (see King et al., 1994), increasing the statistical validity of the analysis (Shadish et al., 2001)
The treatment in our chapter occurs when a template is used in the transfer. When a template is used we will expect to see both higher adoption and better performance at the recipient unit performance than when a template is not used. That is, we expect that $O_2$ (adoption and performance post Wave I) will be higher than $O_1$ (adoption and performance prior to Wave I) and that $O_4$ (adoption and performance post Telesales) will be higher than $O_3$. This is clearly supported by the evidence (refer to table six).

2.6. Alternative Explanations

We now consider alternative explanations for the observed pattern. In order for alternative explanations to template use to account for the observed pattern they must either follow the same pattern of template use, i.e.; be applied, removed, and applied again (Cook & Campbell, 1979; Eisenhardt, 1989; Yin, 1989), or there must be at least one plausible explanation for each one of the three phases of the experiment. To increase the chances of generating a comprehensive set of alternative explanations we organize plausible alternatives following the quasi-experimental logic suggested by Cook and Campbell, (1979) categorizing them into selection, maturation, history, attrition, instrumentation and testing (see Shadish, et al., 2001). Within these categories, we begin with the most plausible rival explanation and continue in decreasing order of plausibility.

2.6.1. Selection

One potential alternative explanation is the use or misuse of information technology (IT). In essence, Wave II may have failed by not effectively utilizing IT
while Telesales was successful because of its innovative use of software. However, such an explanation belies the fact that the Telesales transfer initiative succeeded not just because of the TeleMagic software. Indeed the template, as it existed at Dubai, provided not only the software but also the idea and proof that copy machines could be sold by telephone, the scripts for how to actually sell by telephone, and an example of all nine interdependent sub-processes working concurrently in a single practice. Contact software, including TeleMagic, was available publicly but it is unlikely that a third party software vendor could have provided the level of information necessary to recreate the superior results obtained by the template site. Telesales was not reducible to software alone as evidenced by the repeated iteration back to Dubai to solve implementation problems unrelated to IT.

Connected to this potential explanation is one suggesting that the pattern is due to differences in the level of complexity and interdependence among the three initiatives. Wave I was likely simpler and consisted of completely separate, modular practices that were extensions of existing practices, requiring only moderate levels of change. Wave II was made up of nine interdependent practices that had to be implemented in serial fashion ultimately requiring a large change in existing routines causing the differential results\textsuperscript{11}. The Telesales practice, however, effectively embodied the Wave II model. While somewhat less interdependent (embedding three of the nine interdependent modules in software) it still required the serial implementation of seven interdependent

\textsuperscript{11} This is similar to the concept of multiplicative relationships developed in MacDuffie’s (1995) work.
modules and resulted in the same large scale change as Wave II. For complexity alone to be an alternative explanation one would have to argue that the point of maximum complexity, beyond which a practice cannot effectively be implemented, lies somewhere between seven and nine serial, interdependent processes. While theoretically possible, such a result seems unlikely.

Alternatively, the pattern of success may be due to Team C's use of pilot centers during the Telesales phase. While their use likely had an impact on knowledge transfer effectiveness it underscores rather than negates the value of template use. One could argue that even with a complex practice a pilot center is easier to establish as one has tighter control and may be able to engage in more rapid experimentation in order to achieved desired results. However, the practice at Dubai was transferred to six pilot centers concurrently, all of them successful within a short period of time and the description highlights the specific role of the template in 1. persuading the heads of CBUs to undertake a pilot and 2. providing a reference during the implementation of the pilot centers as unforeseen problems arose. Furthermore, the pilots were then used as templates during the process of transfer to the rest of the units. In a sense, pilot centers may play a role of intermediate template. For instance, in this particular case there was some question as to whether a practice from a small city like Dubai would work effectively in large, European, urban centers. The use of pilots allowed for the additional testing of the knowledge embedded in the template routines before widespread implementation.
Another potential explanation is that the CBUs were under significant pressure to improve sales revenue prior to Wave I and that the subsequent Wave I success removed that pressure. While this possibly explains the lack of adoption of Wave II, Rank Xerox continued to be under some, albeit less, pressure from Xerox USA to improve performance. Moreover the same lower level of pressure to improve performance held for the Telesales phase as well as for Wave II. For this explanation to have been the cause of the pattern of adoption noted in the case pressure would have had to be high for Wave I and Telesales and low during Wave II.

In addition, Wave I and Telesales may have enjoyed high top management support while Wave II did not. This is not the case, however, as all three initiatives had significant top management support with Wave II enjoying more support than Telesales. Indeed, the CEO personally introduced Wave II as one of the top priorities for the Rank Xerox Western European countries the year it was introduced.

It may also be that the levels of adoption and implementation were a result of a perception of the initiative as either a good or bad idea. However, the idea of coverage was fundamental to both Wave II and Telesales and dated to 1988 prior even to the beginning of Wave I. As Olaf Odlind, a senior Team C member pointed out: “In the beginning we didn’t have telesales. . . . but we had from the beginning [the idea of] 100% coverage of the buying window in the sales process.” It is still possible that CBU management may have perceived the embodiment of the idea, not the coverage idea itself, as good and appropriate in Telesales and not in Wave II but such an argument
amounts to underscoring the use of the Dubai template to prove the efficacy of the idea, something which could not be done in Wave II because it had no template.

2.6.2. Maturation

While cyclical forces in the firm’s business cycle may have caused the pattern of performance it is not likely. The entire process of treatment, removal of treatment, and re-treatment spanned uneven segments of the natural business cycle. Furthermore, outside the interventions observed in the experiment, the main direction and processes of the organization did not change significantly during the period of the experiment.

2.6.3. History

Another possibility may also be that the observed pattern is due solely to chance. A simplistic analysis that treats each “wave” as a transfer that either succeeds or fails yields a total of eight possible success / failure patterns. Under such a scenario, the highest probability of observing the actual pattern by chance is no higher than 15% assuming a 2/3 probability of success for each transfer, and is 12% assuming a more realistic .5 probability of success. At the other extreme, when each wave is conceived as 15 independent transfers (one to each of the 15 countries) the probability of all 15 countries achieving success by chance (.5 chance of success) in either Wave I or Telesales alone is a negligible .00003 per wave. Of course there is likely to be some degree of decision interdependence, although Rank Xerox country managers, especially heading country units with natural European rivalries, enjoyed significant autonomy from one another. A conservative assumption would take into consideration the differential
adoption rates observed in Waves I and Wave II considering at least two separate groups, early and late adopters. Even considering such high decision interdependence, the probability of the observed pattern rises no higher than .02. Thus, it seems unlikely that chance alone could explain the observed pattern.

Another potential alternative explanation in this category is the pattern of change in the general business climate in Europe. However, aggregate GDP, after a slight decline of .37% in 1993, rises consistently through the period, varying from 1.6% to 2.75% growth.

A similar explanation is that the pattern of results in the dependent variable is due mainly to competitors rather than actions taken in Rank Xerox. However, the pattern is observed simultaneously across 15 different countries and temporally follows the application and removal of the treatment. For competitors to be the cause one would expect variable performance and timing of performance changes across the 15 countries as competitors’ positions are not likely to be the same in all locations.

2.6.4. Attrition

It may be possible that the results were achieved because the individuals involved were not the same in each wave of the experiment, thereby creating differential performance by virtue of differing personnel. However, Rank Xerox experienced only typical personnel changes during the period in question with no turnover in Team C and minimal attrition in top CBU management.
2.6.5. Instrumentation

This threat to validity involves potential measurement error in the independent variable. If change in the template itself or adaptation of the practice during the transfer process creates enough measurement error whether a template was “used” or not may be called into question. However, each wave used the same process involving the codification and transfer of key success factors (which codification clearly involved the use of templates). The implementation of the key success factors becomes a primary method for judging extent of implementation, providing a rough measure of similarity to the original. Moreover, the Telesales initiative provides further evidence that the template was a critical part of implementation as there were multiple iterations back to Dubai in order to answer unforeseen questions.

2.6.6. Testing

A typical threat in quasi-experiments is testing, where subjects discover the nature of the treatment from their first exposure and alter their later responses as a result. This type of alternative explanation, however, is more viable in psychological tests where one is measuring subjective states than in tests measuring the effect of concrete actions. The interest here is whether an action results in an increase in knowledge transfer effectiveness whether or not the subjects understood the cause/effect relationship at the time. Nevertheless, the actors involved with the transfers did not understand the nature of the treatment until after the experiment was over, minimizing testing as an alternative explanation.
Finally, we recognize there may be an unmeasured variable that accounts for the results. However, the repeated treatment design helps to mitigate this. The fact that the result was replicated in the second treatment, which was applied years after the first treatment, significantly enhances the possibility that the results are due to the use of a template and not some other cause. Table 6 below summarizes the alternative explanations and the arguments against them.
**Table 6: Summary of Alternative Explanations**

<table>
<thead>
<tr>
<th>Explanation</th>
<th>Counter-argument</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave II and Telesales dependent on IT, not template. Wave II did not utilize effectively while Telesales did.</td>
<td>Practice in Dubai consists of 9 interdependent sub-processes of which only 3 are embedded in software. Moreover, template provides 1. idea for use of software, 2. routines for how to use it, 3. routines for connecting software to non IT based sub-routines. Dubai clearly used as template outside of use of IT.</td>
</tr>
<tr>
<td>Pattern is due to differences in complexity and sub-process interdependence.</td>
<td>Telesales practice similar to Wave II in complexity and sub-process interdependence.</td>
</tr>
<tr>
<td>Pattern due to differential expectations as to ease of implementation and subsequent actions, especially the use of pilot centers.</td>
<td>The use of pilot centers underscores importance of templates as 1. template in Dubai clearly used to establish pilot centers, 2. pilot centers themselves were then explicitly used as templates.</td>
</tr>
<tr>
<td>Pattern due to differential pressure to improve results.</td>
<td>Level of pressure was similar for both Wave II and Telesales.</td>
</tr>
<tr>
<td>Pattern due to differential top management support.</td>
<td>All three had top management support with Wave II having significantly more support than Telesales.</td>
</tr>
<tr>
<td>Pattern due to differential perception of initiative as “good” or “bad” idea.</td>
<td>Idea for both Wave II and Telesales, 100% coverage, was identical. Moreover, template in Telesales was explicitly used to persuade CBU management it was a “good” idea, highlighting value of templates.</td>
</tr>
<tr>
<td>Phase of business cycle caused the pattern.</td>
<td>The process of treatment, removal of treatment, treatment spanned uneven segments of the business cycle.</td>
</tr>
<tr>
<td>Pattern due to luck.</td>
<td>The serial pattern occurred simultaneously in 15 countries.</td>
</tr>
<tr>
<td>Pattern due to competitors’ situations.</td>
<td>Pattern occurs similarly across 15 countries. Competitors’ situations not likely to be the same or to change simultaneously in all 15 countries.</td>
</tr>
<tr>
<td>Pattern due to personnel turnover.</td>
<td>No turnover in Team C and minimal turnover in CBU top management.</td>
</tr>
<tr>
<td>Changes in the template or implemented practice make it difficult to tell if a template was used.</td>
<td>Process of implementing extracted key success factors provides a measure of similarity. Description of Telesales implementation provides evidence of direct template use.</td>
</tr>
</tbody>
</table>
2.7. Discussion and Conclusion

Our direct empirical investigation of template use and the effectiveness of knowledge transfer contributes to the literature on knowledge transfer, firm capabilities, and evolutionary economics. It does so primarily by yielding a replicable measure of template use and providing empirical support for the fundamental claim that template use enhances the effectiveness of knowledge transfer. Furthermore our field evidence allows us to complement extant knowledge by suggesting several roles that the template may play during the process of transfer.

2.7.1. A Measure of Template Use

We defined template use as the reliance on an organizational practice that is currently in existence, is composed of a single or connected set of processes, and is consciously used in the replication process. According to such definition, a template was not used in the Wave II initiative because it relied on existing sub-routines that were scattered throughout Europe. Such a collection of practices does not constitute a template because those wishing to replicate the original cannot find the composite routine working as a complete set in any one specific location. The poor performance of Wave II suggests that attempts to combine parts of existing routines may result in decreased transfer effectiveness.

In this light, the investigation of templates reported in this chapter contributes to the literature on the capabilities based view of the firm. The findings suggest that it may be difficult to parlay a collection of small practices or the modification of an existing
practice into a core competence. This suggests a source of variance in combinative capabilities (Kogut and Zander, 1992). Without a tangible instance of the "resource" or "capability", i.e., without a template, the resource may not really exist – at least not in a readily replicable form. This is one possible reason for the existence of gaps between perception and reality in the effective exploitation of knowledge assets.

2.7.2. The Roles of the Template

Template as Referent. In Nelson and Winter’s (1982 pgs. 119-120) conception "...the existing routine serves as a template for the new one. The use of the template makes possible a relatively precise copying of a functioning system that is far too large and complex to be comprehended by a single person. It is not necessary for there to be a central file that contains an articulate account of how the whole thing is done.” This conception is very close to the biological definition of a template where an existing nucleic acid is used as a template to assemble other nucleotides into a new chain of similar nucleotides (Berg & Singer, 1992). In both of these definitions a working substance, be it a routine or a nucleotide, is explicitly used as a reference during the process of copying with aspects of the original being replicated as closely as possible.

While definitions of templates used in other literatures such as Organization Theory (D'Aunno et al., 2000), the Cognitive Sciences (Elsawy & Pauchant, 1988), Information Systems (Hofman & Rockart, 1994), Operations (Staughton & Williams, 1994), and Project Management (Hayes, 2000) do not necessarily refer to precise copying of the
original, all use the term template to refer to some type of referent during the process of implementation or copying.

Similar to the definition of template used by Nelson and Winter (1982) is the notion of script, defined by Barley and Tolbert (1997) as observable, recurrent activities and patterns of interaction that are used to enact institutions. In this sense scripts are referents in terms of being used to enact institutions but also are recurrent patterns of observable behavior. The latter is an essential aspect of templates in an organizational setting as recurrence and observability allow the template to be used to leverage superior organizational routines.

Templates, then, involve recurrent, patterned activities which are observable and can be used as a referent during the process of copying. Unless the routine is so simple that awareness of its existence is enough to implement a suitable copy or the source of the practice can understand it and transfer a codified version without analyzing it, having the template as a referent may be useful in recreating the practice. Even if a codified version is sufficient for a successful transfer, for routines of even minor complexity being able to reference the template may be necessary to create a sufficiently detailed codified version of the routine for the transfer to be successful.

Furthermore, as the complexity and size of the template increases it becomes doubtful that a codified version of the routine will be accurate enough to adequately recreate the practice, increasing the value of using the template itself as a referent during implementation phases of the replication effort as well. The potential inadequacy of
codification alone, in the context of routines of moderate complexity or greater, is due to the boundedness of human rationality (Simon, 1957), tacit elements of individual behavior (Polanyi, 1962), the persistence of rationalized institutional myths (Meyer & Rowan, 1977), fragmentary, myopic and disparate understandings of how the work is accomplished (Carroll, 1998), superstitious learning (Levitt & March, 1988), faulty memory (Golden, 1992), the tendency for codified conceptions to focus narrowly on a single causal explanation at the expense of all others (Miller, 1993), and the necessity for a codified account to represent stable, shared conceptions of work practices (March et al., 1991) which account for the social truce\(^{12}\) upon which the routine is founded (Nelson & Winter, 1982). Finally, as is likely with practices of even moderate complexity (Rivkin, 2001), the presence of causal ambiguity, or irreducible uncertainty about the causal elements of the practice and how they interact (Lippman & Rumelt, 1982), creates further doubt about the accuracy of codified versions of organizational practices.

Thus, except with extremely simple practices one should find a template useful as a referent in replicating the original practice. At first it is useful as a means for the source of the practice to conduct further analysis in an attempt to codify the essential aspects of the routine prior to transmission. As practices become more complex and include elements of causal ambiguity one would expect the template to be more useful as a

\(^{12}\) A social truce represents a “stable accommodation between the requirements of organizational functioning and the motivations of all organizational members...” which is a “necessary concomitant of routine operation” (Nelson & Winter, 1982, p. 108). Attempts at codification have the potential to disrupt the truce as the elements of the routine are probed and made public, resurfacing the conflict suppressed by the routinization of activities.
referent for the recipient during the process of transfer. In this context the template may be used to resolve problems that arise during the replication attempt through "closer scrutiny" of the original (Nelson & Winter, 1982, p. 123), i.e.; as von Hippel (1994) suggests, through problem solving at the location of the original knowledge. The inefficient alternative is that "problems . . . will have to be solved in-situ through a costly process of trial and error, since they cannot be solved through reference to the established template" (Winter & Szulanski, 2001, pp. 18-22).

As routines become larger and more complex, encompassing multiple individuals, departments, units, or geographic sites, or are increasingly different from the recipient unit's base of experience one would expect the importance of the template's role as referent to increase. Moreover, while in the biological model template replication occurs in a single attempt typically with little error, due to bounded rationality as well as to the increased possibility of causal ambiguity even the most careful efforts to replicate organizational practices may miss important details or incorrectly implement essential aspects of the routine. This creates difficulty in successfully reproducing the practice and may require additional observation of the template. Thus, as the template increases in size, complexity, or difference from the recipient's existing routines one would expect to see recipient units iterate back and forth between the template and the copy using the original to address unforeseen implementation problems and as a diagnostic tool to solve difficulties that arise during implementation.
The Rank Xerox case illustrates exactly such a pattern. A template was used more frequently as a referent during the Telesales initiative than during Wave I. During Wave I the template was primarily used as a reference by the source units, Carlos, and other Team C members in an attempt to codify the key success factors of the various practices. Iteration was infrequent as the practices were fairly simple to implement.

The Telesales initiative was larger than Wave I, more complex, and there was greater difference between it and existing routines at recipient units than was the case with Wave I. Specifically Telesales was a larger practice encompassing larger numbers of people and interrelated sub-processes than any Wave I practice which were all discrete sales practices focused at particular segments of the market. As to the degree of difference from existing practices Wave I practices primarily adjusted existing ways of doing business (for instance altering the way color copiers are sold or introducing billing for analyst/support time rather than solely for sales of copiers). Telesales, as Wave II had intended, however, represented a fundamental shift in the way salespeople operated. Along with introducing telephone selling and increasing the focus on database management, Telesales, as Wave II had intended, changed the key reporting metric from number of sales to sales coverage thereby shifting the focus of salespeople from existing to potential customers. This was a much larger change than those represented in Wave I and the amount of iteration between template and replica, as reported earlier, was correspondingly increased. While we were not able to parse out the discrete effects of
size, complexity, and difference it seems reasonable that each contributed to the observed increase in the use of the template as a referent.

The concept of templates as referents, then, explains the pattern of iteration between original and copy that is seen in the data. What it does not explain, however, is the pattern of initiative adoption. Having access to a template does not ensure that the template is used. Reference is only useful once implementation has begun.

Template as Persuader. The definition of template, as well as the case itself, suggests yet another mechanism of operation. Beyond being a referent a template, in this usage, is something that ought to be copied and the term is often synonymous with concepts like prototype, model, or exemplar. In this sense of the word a template is an “example or model deserving imitation” (Oxford English Dictionary, 1989). Organizational practices as templates fit well here as they are typically transferred based on superior results.

Whereas templates as referents play a part during the process of implementation, templates as persuaders may play a part in initiating the transfer. Organizations often have difficulty getting recipient units to adopt new practices. Resistance to change has long been recognized as being critical to influencing the success or failure of new organizational initiatives. Resistance is a natural response because change usually involves moving from the known to the unknown, especially in the case of transferring knowledge. Typically, potential recipients may question the appropriateness of the change and their efficacy in implementing it. The use of templates, as scholars in the
change management literature have suggested (e.g., Armenakis & Harris, 2002) helps overcome resistance by demonstrating results (supporting appropriateness) and providing evidence that someone else in the organizational has already done it (supporting efficacy).

While the replication of organizational routines requires change in the recipient units, templates contain data on the potential outcome. If routines are transferred because of their superior performance the performance itself stands as a witness to the possible results. Templates also allow potential recipient units to see the practice first hand. In the sense that “seeing is believing” the existence of a template may be a powerful force in persuading potential recipients that not only are superior results possible but the current arrangement of activities embodied in the template is a viable way of achieving such results (Armenakis & Harris, 2002). Such tangible proof may well persuade re-use of the knowledge contained in the template.

In contrast, without a template there is no data on potential results and nothing to observe showing whether an idea, composite of previously unconnected routines, or significant adaptation of an existing practice will work as planned. Thus recipients have to rely on faith rather than proof when making the decision to implement, thus lowering the incentive to adopt. Therefore, use of a template is likely to increase the adoption of a transferred routine. Concerning Wave II, Carlos described this pattern as follows:
"What we did was to take pieces of the best practices and create the perfect model that was seen as artificial because in reality it was artificial because nobody had this thing. There is nothing new about [the pieces]. But this [model] is absolutely new. Nobody had done it before, nobody had seen this model. So the reaction, the human one, was, 'Oh, I will not be able to implement this thing.' But because they could not escape that they had to do it they took the second way out saying, 'I'm going to do it,' with the clear intention not to touch it."

As with the referent mechanism, the data in the Rank Xerox case fits this theorized pattern well. Wave I and Telesales both used templates and were adopted by all countries while Wave II did not use a template and was poorly adopted. The existence of the templates and the published results they created seemed critical to adoption. With all three initiatives data from the practices (with Wave II this consisted of data from the unconnected sub processes) was explicitly used to persuade and with Telesales this was combined with extensive observation of the template. With all three initiatives recipient units were highly skeptical and unwilling to initially adopt the practices. With Wave II they remained unconvinced as the composite practice was nowhere in operation and there was no data showing that the practice, in its totality, was practicable. However, with Wave I and Telesales existence of data proving successful results of the working practices as well as opportunities to observe the practices in action overcame the initial resistance. As Carlos explains:

"I took them [to Dubai] in order to get credibility, because they look at you and they say ‘Dubai produces double?’ They don’t like it. They don’t want to believe it. This is the principal about best practices—denial. [But] they went and talked to the people and checked if it was true. It confirmed the performance. So what do you do after that? You have no choice but to believe, even if you don’t want to believe. The results are the results and nobody can go against that.”
2.7.3. Limitations and Future Research

Our conclusions are drawn from the study of a single company and pertain specifically to marketing practices. It should be noted, however, the type of best practice transfer process that Rank Xerox underwent, internal benchmarking, is ubiquitous across industries and its basic format is relatively independent of the type of practice being transferred (Camp, 1989). Moreover replicating superior templates is a fundamental mechanism underlying the growth of franchise organizations (Bradach, 1998). Finally, we are not aware of any characteristics of Rank Xerox or of its served markets that would systematically enhance or dampen the effect of using templates. Hence, we expect that the results to be applicable outside of the realm of Rank Xerox.

Another limitation of our study is that while we can provide anecdotal evidence of the different mechanisms by which the template affects the effectiveness of the transfer we cannot, however, establish systematically how, through which mechanisms, the template enhances the effectiveness of the transfer. This suggests the need to further examine the specific mechanisms through which templates affect the process of transfer.

As Teece (1998) points out, while there are many potentially valid research issues that one could identify in the management of knowledge assets, there are several topics that are particularly salient and warrant special attention. One of them is the need to assemble evidence that firm-level competitive advantage flows fundamentally from difficult to replicate knowledge assets. The analysis of the Rank Xerox example
highlights why that may be the case. Furthermore, it suggests that substantial progress could be achieved in that agenda by attending to the role of the template.
3. Reference and Persuasion: Knowledge Transfer Methods and Their Underlying Mechanisms

One of the fundamental tenets emerging from strategy research in the last decade is that leveraging firm knowledge assets through their re-use in different geographic settings is a fundamental source of competitive advantage (Argote & Ingram, 2000; Eisenhardt & Martin, 2000; Gupta & Govindarajan, 2000; Winter, 1995; Zander & Kogut, 1995). Specifically, Teece, Pisano, and Shuen (1997), following Nelson and Winter (1982), suggest that the knowledge assets most clearly contributing to competitive advantage are those embedded in organizational routines due to inherent difficulties in imitating them. The transfer, or replication, of organizational practices is thus critical to gaining competitive advantage. However, both anecdotal evidence and current research has also shown that such transfers are difficult at best (Anonymous, 1990; Kerwin & Woodruff, 1992; Szulanski, 1996; Szulanski & Jensen, 2006) making the study of how to overcome transfer difficulty central to an understanding of competitive advantage.

However, despite the centrality of the subject, academic studies of the methods actually used to successfully leverage organizational routines are few and far between. While the literature is young, research to date, has either empirically identified or at least conceptually investigated a series of methods such as rotation of personnel (Almeida & Kogut, 1999), use of multi-unit task teams (Ranft & Lord, 2002), informal visits (Ingram

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13 The research reported in this chapter builds on previous work by Gabriel Szulanski (1995a), and was, in part, conducted jointly with him. When published as an article, it will appear as co-authored work.
& Simons, 2002), central consulting resources (Darr *et al.*, 1995), etc. These are important beginnings to studying the mechanisms by which competitive advantage is gained through the leveraging of knowledge assets. However, the methods discussed in the literature are typically explored singly with only a few studies exploring more than a couple of methods simultaneously (cf. Chiesa & Manzini, 1996). Moreover, current studies are often not specific to the transfer of organizational practices and are often not directed toward an understanding of how specific methods affect transfer success or difficulty. This has resulted in a somewhat disparate and fractured body of literature that, while elucidating the use of specific methods, does not help in understanding the similarities and differences between them and determining their underlying functionality in aiding the transfer of organizational practices. What is needed is an empirical exploration of any underlying dimensions that can be used to classify and group the various methods.

Furthermore, while most, if not all, of the methods discussed in the literature are theorized and/or empirically shown to be beneficial to transfer efforts, little has been done to correlate specific methods, or their underlying factors, with the sequential stages of knowledge transfer. Previous research has observed that transfers of organizational practices occur across different temporal stages: initiation, implementation, ramp-up, and integration (Szulanski, 2000b). It is possible that specific mechanisms underlying the various types of methods may have a differential effect on transfer effectiveness at different points during the transfer process.
This chapter intends to fill the current gap in the literature by exploring a wide range of methods used to transfer organizational practices, empirically exploring underlying dimensions, and testing the effect of those dimensions on the stickiness, or difficulty, of the transfer across the temporal stages of transfer. Such an exploration can contribute to our understanding of how competitive advantage flows from knowledge assets and is intended to provide a foundation for future studies exploring the dynamics of the replication of organizational routines.

The transfer methods explored in this chapter derive from a literature review with additional methods identified through field research. In all, 38 methods are identified and measured along with measuring the stickiness of the transfer across four temporal transfer stages via a survey of 122 transfers of organizational practices in eight organizations. A multidimensional scaling analysis indicates that there are two underlying dimensions of methods used to transfer organizational practices: Reference and Persuasion. The elucidation of these two mechanisms contributes to the literatures on replication and knowledge transfer as well as making specific contributions to debates involving templates, stickiness, and replication vs. imitation.

3.1. Competitive Advantage and Knowledge Transfer Methods

The concept that knowledge is a principal foundation for gaining and maintaining competitive advantage has become central to theories of differential firm performance (Barney, 1986; Dierickx & Cool, 1989; Spender & Grant, 1996; Wernerfelt, 1984; Winter, 1987). This is to be expected in market economies where information about
other types of factors such as materials and labor is abundant and nearly instantaneous.
Indeed, many argue that the long-term ability of firms to compete is increasingly
predicated on their ability to identify knowledge assets and mobilize them within the firm
(Argote & Ingram, 2000; Eisenhardt & Martin, 2000; Gupta & Govindarajan, 2000;
Zander & Kogut, 1995). This thought is clearly echoed in the organizational learning
literature where one of the key determinants of organizational learning rates is argued to
be the ability to learn from other units within the firm (Argote, 1999; Baum & Ingram,
1998). This is particularly true of global industries where the increased scale of
competition tends to drive the value of most basic inputs toward commoditization.

Among the most valuable of knowledge assets are those embedded in
organizational routines or practices as these are among the ones most likely to contribute
to competitive advantage (Teece et al., 1997). This is due partly to the fact that most
organizational routines are developed within the organization and hence not purchased on
open factor markets where potential value is often bid away (Barney, 1986). In addition,
organizational routines, because they are developed internally are not readily observable.
Likewise they tend to be large, complex, and causally ambiguous (Lippman & Rumelt,
1982; Rivkin, 2000). As such, they are apt to be more difficult to imitate than other types
of strategic factors, including other types of knowledge (Winter, 1995).

One of the primary methods of leveraging knowledge assets embedded in
organizational routines is the replication of those routines in a different geographic
setting (Teece et al., 1997; Winter, 1995; Winter & Szulanski, 2001). This is particularly
true for franchise organizations and large organizations with distributed operations, including multi-national corporations where the re-use of firm specific knowledge in different geographic markets has long been acknowledged as critical for success (Buckley & Casson, 1976; Dunning, 1977; Hymer, 1976; Kogut & Zander, 1993; Zaheer, 1995).

It makes economic sense for a firm to re-use, or replicate, its successful practices rather than re-create them de novo, and to do so before its competition does (Nelson & Winter, 1982; Rivkin, 2000; Tecece et al., 1997; Winter, 1995). However, any competitive advantage derived from the replication of organizational routines is predicated on the actual ability to transfer those routines. Research on stickiness, or difficulty encountered during the transfer of organizational practices (Szulanski, 1996; von Hippel, 1994), indicates that such an ability can not be taken for granted. Moreover, given that practitioners report stickiness to be a major problem in intra-firm practice transfer (Anonymous, 1993; Galbraith, 1990; Gupta & Govindarajan, 2000; Kerwin & Woodruff, 1992), research into methods that increase the effectiveness of knowledge transfer is highly needed.

One such emerging body of literature (cf. Chai et al., 2003) is that which analyzes specific methods of transferring knowledge, such as the use of internal databases, rotation of personnel, best practice manuals, multi-unit teams, etc and their effect on transfer effectiveness. Studies of this nature are an important addition to a theory of competitive
advantage through replication as they explore the effect of specific, concrete steps firms take to transfer practices.

3.2. Methods Used in the Intra-firm Transfer of Knowledge

While some serious academic work on specific methods for transferring knowledge has been done, most of the existing literature is conceptual or anecdotal and comes from practitioner publications. In both the academic and practitioner literatures most studies examine only a few transfer methods while many only mention potential methods in passing without directly testing the effect they may have on transfer effectiveness. Because of the disjointed nature of the literature dozens of transfer methods are ultimately proposed with little work being done to categorize them according to underlying, theoretically useful, dimensions\(^\text{14}\).

In order to identify the relevant methods of transferring knowledge we conducted a review of both the major academic (specific to organizations) and practitioner literatures. Because the practitioner literature in this area is vast and typically not systematic in its research approach, we conducted a thorough review of the general practitioner literature for the last five years and of the top four practitioner journals (Harvard Business Review, Sloan Management Review, Academy of Management Executive, and California Management Review) for the last 10 years. The review of the practitioner literature also included practitioner books published on various knowledge

\(^{14}\) The exception is Chai et al.'s (2003) qualitative study which utilizes a series of case studies involving the transfer of R&D knowledge to categorize transfer methods according to the type of knowledge transferred, the role it plays in creating awareness and aiding the transfer, and the degree of its richness or reach.
issues within the last 10 years. As both the academic and practitioner literatures have
typically not discriminated between transfers of organizational practices, technology, and
individual knowledge (Argote & Ingram, 2000) we augmented the list of transfer
methods with field research involving interviews with individuals involved in intra-firm
best practice transfer in 60 different firms participating in the American Product and
Quality Center's International Benchmarking Clearinghouse. Finally, a pilot test of the
survey detailed below identified a few additional methods.

The methods included in the chapter are not meant to be an exhaustive nor
discriminant list. Rather, they are intended to span a wide variation in potential methods.
We augmented the methods identified in the literature with field research to ensure that
the dimensions elucidated in our analysis are representative of the broadest base of
methods we could reasonably measure. There may be overlap between some methods, so
the methods are unlikely to be completely distinct. Pilots of the survey, as well as the
analysis conducted in this chapter, however, suggest that no methods were identical. In
all, 38 different methods were identified. Table 7 lists the methods alphabetically and
defines them.
<table>
<thead>
<tr>
<th>Transfer Method</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Audit Teams</td>
<td>Use of teams external to a specific unit that measure and/or validate that unit's performance.</td>
</tr>
<tr>
<td>2. Best Practice Manuals</td>
<td>Manuals describing a best practice often including implementation steps.</td>
</tr>
<tr>
<td>3. Central Advisor/Expert Resources</td>
<td>An individual or group tasked by headquarters to be a central repository and reference for specific knowledge.</td>
</tr>
<tr>
<td>4. Central Consulting Resources</td>
<td>Resources controlled centrally which can be used at the recipient site to help disseminate and implement best practices.</td>
</tr>
<tr>
<td>5. Central Function Controls Activities</td>
<td>A function within headquarters, such as accounting, or even IT, that dictates how specific practices should be performed.</td>
</tr>
<tr>
<td>6. Company Newsletters</td>
<td>Documents reporting, on an ongoing, regular basis, news from the various subunits of a firm.</td>
</tr>
<tr>
<td>7. Company Videos</td>
<td>Videotapes circulated typically for training purposes.</td>
</tr>
<tr>
<td>8. Company-wide Database of Best Practices</td>
<td>Company wide, electronic database that lists best practices often including some details as to their functioning.</td>
</tr>
<tr>
<td>9. Conferences</td>
<td>Meetings held between various units with the purpose of exchanging ideas.</td>
</tr>
<tr>
<td>10. Continuous Improvement Efforts</td>
<td>Formal efforts, such as Kaizen, aimed at continually improving the function of a particular process.</td>
</tr>
<tr>
<td>11. Conventions</td>
<td>Formal company meetings involving individuals from multiple units where ideas are often disseminated.</td>
</tr>
<tr>
<td>12. Corporate Decides what is Best Practice</td>
<td>Headquarters determines which practices are best practices.</td>
</tr>
<tr>
<td>13. Corporate Sets Policy Based on Best Practice</td>
<td>Headquarters creates policy to be followed in many units based upon a best practice.</td>
</tr>
<tr>
<td>14. Discussions Held to Influence Units to Raise Quality</td>
<td>Discussions held either between units or between corporate and a unit with the intention to influence a unit to increase the quality of its output.</td>
</tr>
<tr>
<td>15. Formal Control Procedures</td>
<td>Formalized procedures implemented to control a specific process.</td>
</tr>
<tr>
<td>16. Help from Other Units</td>
<td>General help from other units, typically in solving a specific problem.</td>
</tr>
<tr>
<td>17. Informal Control Procedures</td>
<td>Informal procedures utilized in controlling a specific process.</td>
</tr>
<tr>
<td>18. Informal Visits</td>
<td>Informal inter-unit visits.</td>
</tr>
<tr>
<td>19. Intra-Company Forums</td>
<td>Meetings (either face-to-face or electronic) held with individuals from multiple units for the express purpose of exchanging information and ideas on a specific topic. These are typically more specific than conferences and allow for much greater interaction.</td>
</tr>
<tr>
<td>20. Lead Business Units</td>
<td>Business units specified by headquarters as leading in a particular performance category.</td>
</tr>
<tr>
<td>21. Line Instruction</td>
<td>Specific step by step instructions for how to perform a particular task.</td>
</tr>
<tr>
<td>22. Meet in Conference and Agree to Help Each Other</td>
<td>Meetings between two units for the express purpose of helping each other with a specific issue.</td>
</tr>
<tr>
<td>23. Multi-Unit Task Teams</td>
<td>Project teams composed of individuals from multiple units.</td>
</tr>
</tbody>
</table>
Table 7 continued

<table>
<thead>
<tr>
<th>Transfer Method</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>24. Newsletter Describing New Methods</td>
<td>A specific type of newsletter whose purpose is to disseminate new task methods.</td>
</tr>
<tr>
<td>25. Operational Reviews</td>
<td>A formal review process for assessing internal operations to identify areas needing improvement.</td>
</tr>
<tr>
<td>26. Organized Periodic Long Visits</td>
<td>Formal inter-unit visits lasting more than a week.</td>
</tr>
<tr>
<td>27. Organized Periodic Short Visits</td>
<td>Formal inter-unit visits lasting less than a week.</td>
</tr>
<tr>
<td>28. Presentations</td>
<td>Presentations of material before an audience.</td>
</tr>
<tr>
<td>29. Project Team Develops Recommendations</td>
<td>The project team responsible for the transfer develops recommendations as to what aspects of the best practice ought to be implemented and what steps should be taken for that to occur.</td>
</tr>
<tr>
<td>30. Project Team Develops Standards for Best Practice</td>
<td>The project team responsible for the transfer surveys other business units and determines what best practice is.</td>
</tr>
<tr>
<td>31. Project Team Other</td>
<td>Other actions taken by the project team responsible for the transfer beyond determining best practice and developing recommendations for implementation.</td>
</tr>
<tr>
<td>32. Project Team Recommendation Guidelines</td>
<td>Specific guidelines are given to the project team as to how they are to develop recommendations concerning what is to be transferred and how it is to be implemented.</td>
</tr>
<tr>
<td>33. Reengineering Efforts</td>
<td>Fundamental redesigning of business processes with the intention to achieve dramatic improvements in specific performance measures.</td>
</tr>
<tr>
<td>34. Rotation of Personnel</td>
<td>The movement of personnel from one job type and/or location to another. This includes both explicit rotation as a management policy and implicit rotation in the form of employee mobility.</td>
</tr>
<tr>
<td>35. Skill Pool Management</td>
<td>The explicit hiring and training of personnel so as to create and/or maintain a specific set of employee skills.</td>
</tr>
<tr>
<td>36. Start Up Team</td>
<td>The team of employees first tasked with implementing a new practice at a recipient site. This is different from the project team in that the start up team actually performs the new practice.</td>
</tr>
<tr>
<td>37. Total Quality Management Efforts</td>
<td>A company-wide focus on improving processes critical to ensuring product quality.</td>
</tr>
<tr>
<td>38. Workshops</td>
<td>Training sessions typically lasting a day or more, often occurring offsite.</td>
</tr>
</tbody>
</table>
Given the plethora of methods it is likely that there are unifying constructs, or dimensions, underlying them. Little has been done, however, to identify, let alone test for, underlying similarities. An initial step in this direction is a classificatory approach that empirically derives the dimensions relevant to transfer difficulty, or stickiness, which may undergird the various methods in order to provide a foundation for differentiating between them.

3.3. Data

3.3.1. Sample and Procedures

Data were collected through a two-step survey\textsuperscript{15}. The first step of the survey asked companies belonging to the American Productivity and Quality Center’s International Benchmark Clearinghouse to provide a list of intra-firm transfers for study that included sufficient detail about the parties involved in those transfers. The International Benchmark Clearinghouse was considered an excellent source as firms involved in benchmarking tend also to be involved in intra-firm transfers of best practices (Camp, 1989). More than 60 companies, with varying degrees of experience in the transfer of practices, expressed interest. We interviewed individuals involved in knowledge transfer for each of the 60 firms with the specific intent of uncovering the types of methods used for transferring knowledge. In conjunction with a literature review, the methods listed in Table 7 were derived from this process.

\textsuperscript{15}The data was collected as part of Gabriel Szulanski’s dissertation (1995a).
Of the group of 60 original firms, 12 were able to provide a list of specific potential transfers for study, with eight providing entries of sufficient quality to warrant continuation of their involvement in the research. The eight companies were: AMP, AT&T Paradyne, British Petroleum, Burmah Castrol, Chevron Corporation, EDS, Kaiser Permanente, and Rank Xerox. The second step of the survey was devised to analyze specific transfers. Companies were directed to search for transfers of practices that could not be performed by a single individual but rather required the involvement of a group. The final sample consisted of 271 returned questionnaires, spanning 122 transfers of 38 practices\(^\text{16}\), for a response rate of 61%.

Because we are examining the mechanisms underlying knowledge transfer methods the unit of analysis is a transfer initiative. To triangulate and obtain the most objective measures possible, however, separate but identical questionnaires were sent to an individual within a source, a recipient, and a third party unit for each transfer. Triangulation using all three respondent types was considered appropriate as individuals within each type of unit (source, recipient, and third party) may not have been completely aware of the full range of methods used in the transfer. For instance, individuals within recipient and third party units may indicate that the recipient utilized a central advisor while an individual within the source unit may not be aware of the incident.

Alternatively, a source may indicate that headquarters used an audit team to validate their

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\(^{16}\) The sample contained both technical and administrative practices. Examples of technical practices are software development procedures and drawing standards. Examples of administrative practices are upward appraisal and activity-based costing (ABC). Full disclosure of the practices studied is precluded by a guarantee of confidentiality.
best practice while the recipient may not have been aware. Given the possibility that each type of respondent may have seen a different set of methods being used in the transfer, triangulation ensures the most complete understanding of method utilization.

The respondents included 110 sources units, 101 recipient units and 60 third parties. Average item non-response was lower than 5%. An average of 2.2 questionnaires was received for each transfer. For the stickiness variables, as well as the control variables used later on, an intraclass correlation analysis indicated high inter-rater reliability (from 0.47 to 0.60) between the three perspectives suggesting that observations should consist of the average of the three perspectives for each transfer (average raters coefficient ranges from 0.73 to 0.82). The final dataset thus consists of an average response for each transfer (for a total N of 122).

3.3.2. Construction of Measures

The measurement of the specific methods used during a transfer was based on the list of methods suggested by the literature review and the field research. In each case we asked respondents to list the methods used in their specific practice transfer. Dichotomous variables for each method were then constructed indicating whether method use was reported by any of the three respondents for a specific transfer.

Because we are ultimately interested in how knowledge transfer leads to competitive advantage the goal of this chapter is to discover underlying mechanisms related to transfer success or difficulty. One could potentially measure all similarities between methods. However, we are interested specifically in mechanisms for
overcoming transfer difficulty rather than similarities between methods in general, requiring a method of correlation directed specifically at transfer stickiness. While measuring general co-occurrence is less constraining it may group methods according to dimensions irrelevant for transfer success. The method for determining similarity and difference in relation to stickiness is detailed in the next section, section 3.4.

Data for the stickiness measures (stickiness at each temporal stage of a transfer), as well as the control measures indicated below, was collected in the same survey as the transfer methods. The measures are derived from those used in previous published research (for a complete treatment of the development of the measures see Szulanski, 1996) and are based on events normally expected to occur at a particular stage in a transfer, focusing primarily on specific behaviors. Each construct consists of multiple-item scales with the details of the items included in each construct included in the appendix.

3.4. Analysis to Identify Underlying Mechanisms

We analyzed the data using multidimensional scaling (MDS) because of its ability to detect meaningful underlying dimensions based on similarities or dissimilarities between objects (Eckes, 1994; Kruskal & Wish, 1978), in this case between transfer methods. The scaling algorithm creates a “map” by positioning objects in Euclidean space such that pairs with small distance scores are closer than those with large scores. MDS is somewhat related to both Factor and Cluster Analyses in that it illuminates the underlying structure of data by examining the spatial relationships between objects. It
has advantages for this type of research, however, in that it can use any type of dissimilarity matrix in addition to correlation matrices, clearly delineates the appropriate number of underlying dimensions while allowing that methods may exhibit a mix of dimensional attributes, and is less reliant than cluster analysis on subjective researcher interpretation.

The input to an MDS analysis consists of a proximity or dissimilarity matrix. In order to focus the analysis on underlying mechanisms related to transfer effectiveness, following traditional MDS procedures (Kruskal & Wish, 1978; Wish & Carroll, 1974) we first computed the point-biserial correlation (a member of the Pearson correlation family, used when one variable is continuous and the other dichotomous) between each of the 38 methods and the four measures of stickiness, one measure for each temporal stage of the a transfer. We then computed the Euclidean distance between each method pair for all four of the correlation matrices. Finally, we summed the value of the four distances (one for each stage of the transfer) for each method pair resulting in a single dissimilarity matrix. In essence, two methods are measured as similar if they both tend to be used in transfers of similar overall stickiness, providing a measure of similarity in relation to overall transfer difficulty.

To determine the appropriate number of underlying dimensions we created five different configurations of the transfer methods ranging from one dimension to five dimensions. We used Kruskal and Wish’s (1978) stress index to determine which configuration explained the most variance, with higher values indicating poorer fit.
then conducted a scree test by plotting all five stress values\textsuperscript{17}. The one dimensional solution had a stress index of .217. The two dimensional solution exhibited a sharp drop in stress to .078. The three dimension, four dimension, and five dimension solutions then tapered off much more slowly, registering .052, .041, and .035 respectively. Thus the scree plot indicates that two dimensions represents the most parsimonious and accurate description of the data. The decrease in the stress index for the third, fourth, and fifth dimensions is not sufficient to warrant the more complex spatial representation.

3.5. Results

Figure 1 shows the two dimension solution. For clarity the methods are denoted by numbers which refer to the numbering in Table 7 where the methods are listed alphabetically. It should be noted that any MDS configuration can be rotated freely, making interpretation somewhat difficult. The rotation and subsequent interpretation below was chosen as it proffers face validity and conforms as well to previous theory concerning both knowledge transfer (cf. Nelson & Winter, 1982; Szulanski & Jensen, 2006; Winter & Szulanski, 2001) and organizational change (of which knowledge transfer is a subset) (cf. Armenakis & Harris, 2002; Bovey & Hede, 2001). Following standard MDS procedures (Kruskal & Wish, 1978) we constructed our interpretation through an iterative process beginning with differences between methods at opposite poles working inward, broadening the interpretation as we went to include the additional methods.

\textsuperscript{17}The plot produces a curve with the appropriate number of dimensions determined by the point where the curve levels off (Cattell, 1986).
Any interpretation, however, may be subject to researcher subjectivity and idiosyncrasy. Therefore, following Kruskal and Wish (1978), the succeeding section (section 3.6) seeks to establish the interpretation more rigorously through a series of regression models. In essence, the degree of nomological validity increases to the extent one can show association with a construct theoretically argued to have a systematic relationship with the proposed dimensions. The existence of such an association thus provides some proof that our identification of the underlying mechanisms is indeed correct. First, however, we must interpret the MDS results.

**Figure 1: Scatter Plot of Methods in Dimensional Space**

![Scatter Plot of Methods in Dimensional Space](image)
A discussion of the interpretation of the underlying dimensions follows.

3.5.1. **Dimension One: Persuasion**

Relationships between the methods and the first dimension suggest a possible interpretative label reflecting the methods’ ability to persuade recipient units to undertake the transfer. Many of the methods on the right side of the zero point for dimension one either explicitly or implicitly point out deficiencies in recipient performance or point to superior results in potential source units, often including either interaction with others or direct observation of superior performing units which may tend to heighten the saliency of any performance gaps. Most of the methods on the left do not include such components.

For instance on the right we find methods such as Audit Teams (method #1: position on MDS plot 1.3, .87) which validate superior results at a source site or indicate inferior results at a recipient site; Lead Business Units (#20: .41, -.67) which are units that headquarters points out as achieving superior results; Total Quality Management (#37: .80, -.73) which often includes internal benchmarking highlighting the differences between superior performers and the focal unit; Corporate Setting Policy based on Best Practice (#13: 1.52, -.08) which implicitly includes performance comparison; and Visits both Long (#26: .20, -.35), Short (#27: 2.25, .27), and Informal (#18: .93, -.26), which may also serve to highlight differences in performance between units.

Methods on the left of the dimension one zero point include Reengineering (#33: -.03, .16), Formal (#15: -.60, .92) and Informal Control Procedures (#17: -.10, .79), and
Operational Reviews (#25: -.73, -.29) which are often methods used in ramping up an already transferred practice, although there are some surprises on the left side including Corporate Selecting Best Practice (#12: -1.82, .51) and Newsletters outlining New Methods (#24: -1.99; -.01) which one would assume to carry a persuasive component to them. A discussion of the nature of persuasion may suggest why these two are low on the Persuasion dimension.

The Persuasion dimension, while not prominent in the literature directly dealing with knowledge transfer, is represented in the literature on organizational change, which is a fundamental part of instituting new practices. Specifically, organizations often have difficulty getting recipient units to adopt new practices. Resistance to change has long been recognized as being critical to influencing the success or failure of new organizational initiatives. Resistance is a natural response because change usually involves moving from the known to the unknown, especially in the case of transferring knowledge. Typically, potential recipients may question the appropriateness of the change and their efficacy in implementing it (Armenakis & Harris, 2002). Not only do the methods to the right of the zero mark tend to point out differential performance but, for the most part, do so with tangible proof of the difference. Tangible proof helps overcome resistance by demonstrating results (supporting appropriateness) and providing evidence that someone else in the organizational has already done it (supporting efficacy) (cf. Armenakis & Harris, 2002).
Providing proof of appropriateness and efficacy occurs with all of the methods at the far right of the plot. With methods such as Short Visits (#27: 2.25, .27) the potential recipient of a transferred practice is directly exposed to the practice providing both proof of superior performance and proof of the efficacy of the actual operation of the practice. Corporate Setting Policy based on Best Practice (#13: 1.52, -.08) serves a similar function. While, with this method alone, the recipient does not have the benefit of direct observation, the new policy sends the signal that headquarters sees a gap in performance and expects knowledge transfer to occur, a situation which is likely, depending on the consequences for failure to act, to be suitably persuasive. In another example, the use of Audit Teams (#1: 1.3, .87) is specifically intended to validate performance, either superior or inferior (along with providing some answers as to why). Such validation is arguably essential to persuasive efforts as it indicates both appropriateness and efficacy.

Those at the far left of the plot, while on the surface involving persuasion, do not provide proof of either appropriateness or efficacy. For example, Corporate Selecting Best Practice (#12: -1.82, .51), alone, has no signal value for potential recipients. Indeed, this method alone does not notify potential recipients that a best practice even exists. Newsletters outlining New Methods (#24: -1.99; -.01), while possibly indicating that superior performance exists, may also lack sufficient signal value to be persuasive. Typically newsletters are relatively short documents providing only anecdotes of what others are doing. Given that the transfer of organizational practices often entails the expenditure of significant resources one is not surprised to find that most of the
“Persuasive” methods (those on the right hand side of the plot) either involve direct observation by the recipient unit (Long, Short, and Informal Visits, Start Up Team, Help from Other Units, Intra Company Forums, Total Quality Management), official designations (Corporate Sets Policy Based on Best Practice, Discussions Held by Corporate to Influence Units to Raise Quality, Project Team Develops Standards for Best Practice, Project Team Guidelines), or official proof (Lead Units, Central Advisor/Expert, Audit Teams, Best Practice Manuals, Videos) of superior and inferior performance, or significant interaction with individuals directly involved with the superior performing practice. Newsletters (#24: -1.99, -.01; #6: -1.03, -.08) alone contain none of these elements. Likewise, other relatively impersonal methods such as Conventions (#11: -.96, .32), Presentations (#28: -.65, .11), and Conferences (#9: -1.00, .18) may lack the rich signals necessary to proving differential performance and the efficacy of implementing a new practice. Certainly, procedural based methods such as Reengineering (#33: -.03, .16) and Formal (#15: -.60, .92) and Informal Controls (#17: -.10, .79) lack the elements of persuasion.

3.5.2. Dimension Two: Reference

Relationships between the methods and the second dimension suggest a possible interpretive label reflecting the methods’ use of the knowledge contained in the original practice, i.e.; the ability of the method to refer to the original during the process of implementation. While with the Persuasion dimension the original practice serves as an input to the transfer by highlighting performance differentials and motivating adoption,
the second dimension involves the details of the original practice as an input to recreating that practice elsewhere.

The methods above the zero point on the second dimension highlight referring to the original practice during implementation. Specifically, they involve implementation of the transferred practice using either information codified from the original, methods for implementing tacit knowledge embedded in the original, or planning and control procedures which imply prior codification, all of which involve referring to knowledge contained in the original practice as an aid in successful implementation.

For instance, Best Practice Manuals (#2: .73, .26), Best Practice Databases (#8: -.50, .03), and Presentations (#28: -.65, .11) are all methods for capturing, codifying, and sharing the knowledge contained in the original practice. Audit Teams (#1: 1.3, .87), Short Visits (#27: 2.25, .27), Conferences (#9: -1.00, .18), Multi-Unit Teams (#23: -1.20, .20), and Central Advisors (#3: .71, .08) among others, include the possibility of transferring more tacit knowledge and referring to the original practice as a means of diagnosing unforeseen implementation problems, whether that is through direct observation or asking questions of those who understand the practice. Other methods, such as Reengineering (#33: -.03, .16) and Formal (#15: -.60, .92) and Informal Control (#17: -.10, .79) procedures involve planning and procedures which are methods for ensuring compliance with the original practice during implementation implying codification and the subsequent ability to reference knowledge contained in the original. Those methods below the zero point on dimension two may contain some of these traits.
but to a lesser degree, if at all. For instance, Discussions held to Influence Units to Raise Quality (#14: .18, -.87), Lead Units (#20: .41, -.67), Newsletters (#6: -1.03, -.08) are methods used to raise the awareness of specific practices rather than convey specific implementation help.

This dimension is more directly related to the extant organizations literature on knowledge transfer. For instance, it is related to Nelson and Winter's conception of a template which is used as a referent during the transfer process (1982 pgs. 119-120): "... the existing routine serves as a template for the new one. The use of the template makes possible a relatively precise copying of a functioning system that is far too large and complex to be comprehended by a single person." A survey of the methods at the top and bottom of the plot highlight the role of Reference. For instance, Formal (#15: -.60, .92) and Informal Control (#17: -.10, .79) procedures, to be efficacious, require the use of knowledge contained in the original. In order to establish procedures for implementing a practice one has to understand the original, implying a priori reference to the original. The use of Audit Teams (#1: 1.3, .87) even more explicitly involves reference. Audit Teams, while pointing out differential performance, as mentioned in the previous section, also study the original practice in detail in order to ascertain why superior performance is occurring.

The methods at the bottom of the plot do not access the knowledge contained in the original practice much if at all. For instance, organizational practices tend to be complicated involving multiple individuals and multiple activities. While a Video (#7: 75

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.60, -1.05) may be able to adequately codify the knowledge for individual level practice transfers. Videos for organizational practice transfers may lack the informational content to be useful. Neither Meeting in a Conference to decide to Help One Another (#22: -.34, -.81) nor Discussions held to Influence Units to Raise Quality (#14: .18, -.87) are focused on referring to the original practice in order to extract its knowledge. Neither method is likely to involve much of the knowledge from the original and hence is expected to score low on the Reference dimension.

3.5.3. The Four Primary Categories

Of course, many methods are not purely persuasive or referential containing, to a greater or lesser degree, aspects of both or neither, being located in the upper right or lower left of the dimensional space created by the two underlying mechanisms. This suggests that knowledge transfer methods can be classified into four primary categories based on their location in the two dimensional space: 1) methods that involve only reference (upper left quadrant), 2) only persuasion (lower right quadrant), 3) both reference and persuasion (upper right quadrant), 4) or neither reference nor persuasion (lower right quadrant). Figure 2 illustrates the categorization. While there is little differentiation of methods at the margin, categorizing the methods by quadrants provides a straightforward way to conceptualize the differences between them.
Of course there are other potential ways of categorizing knowledge transfer methods, including other dimensions mentioned in the literature such as richness vs. reach (Daft & Lengel, 1986). Multidimensional Scaling, however, is useful in that it can indicate which dimensions are most important in terms of transfer effectiveness rather than those that are just plausible (Kruskal & Wish, 1978). If the resulting dimensions are to be useful for future research, however, one must take great care to ensure that the initial, subjective labeling of the dimensions has validity. To that end we followed up the initial analysis with a set of predictions and analyses as to how methods belonging to...
each quadrant of the two dimensional space affect stickiness at each temporal stage of the transfer process. If the results agree with reasonable predictions one can conclude with some confidence that Persuasion and Reference are indeed the two primary mechanisms underlying the various methods for transferring knowledge.

3.6. Nomological Validation

Accordingly, given the dimensions identified above, we next examine how they influence the effectiveness of transferring organizational practices in terms of the stickiness, or difficulty, of the transfer. This analysis has a dual purpose. First it allows us to validate the identified constructs underlying the various transfer methods. As will be discussed below, based on theoretical reasoning one could predict a differential pattern of effects on stickiness for each of the four quadrants across the four temporal stages of a transfer. This phase of the analysis involves nomological, or criterion, validation where conclusions of construct validity are enhanced by testing a theoretical pattern against one observed in the data (Trochim, 2001). To construct the dissimilarity matrix for the MDS analysis we used coefficients measuring the degree of correlation between method usage and aggregate stickiness. In this analysis we use an outside criterion analyzing the effect of the underlying dimensions on each temporal stage of knowledge transfer separately. The issue here is not the effect on overall stickiness but the pattern of effects over the entire temporal process of transferring knowledge.

The second phase of this part of the analysis is a test of the statistical significance of the four groups of methods vis a vis stickiness over each of the four temporal stages.
This type of an analysis is intended to test whether timing of method use is a legitimate contingency factor that can aid in differentiating between the effectiveness of the various types of methods.

Before we look at the theoretical arguments behind the effect of each group of methods, however, we need to detail the four temporal stages of organizational practice transfer.

3.6.1. The Temporal Stages of Organizational Practice Transfer

As mentioned previously, prior research has established that there are four distinct stages in transfers of organizational practices (Szulanski, 2000b). In the broader knowledge transfer literature, a distinction is generally made between the initiation and implementation of a transfer (cf. Chai et al., 2003). In this work, as in previous work specifically identifying stages of practice transfer (Szulanski, 2000b), the initiation stage extends from initial searches for suitable practices for transfer up to the decision to transfer a practice. The implementation phase is subdivided between the initial implementation effort, a period of ramping up to satisfactory performance, and the permanent integration of the practice at the recipient site.

The initial implementation comprises "learning before doing" (Pisano, 1996), either through planning (Argote, 1999) or offsite experimentation with such mechanisms as pilots. This stage ends with the first day of actual use of the practice at the recipient site. The ramp-up stage extends from the first day of use until satisfactory results are achieved resulting in a decision to continue the practice permanently. This stage is
marked by either “learning by doing” (von Hippel & Tyre, 1995) and/or referring to the original practice to resolve unexpected problems that arise during implementation (Winter & Szulanski, 2001). The final stage is integration where the practice is institutionalized and made permanent in the recipient unit.

Each stage of transfer is likely to experience stickiness differently (Szulanski, 2000b). For instance, initiation stickiness is comprised of difficulty in recognizing opportunities for transfer and acting on them. As the implementation stage involves the exchange of information and resources between the source and recipient units, stickiness in this stage is likely to consist of difficulties in overcoming technological gaps between the source and recipient and in communicating and coordinating effectively. Difficulty in the ramp-up phase is comprised of unexpected problems that arise during the deployment of the practice. The greater the number and gravity of the problems, the more sticky the transfer is likely to be. Finally, stickiness during the integration stage corresponds to the effort required to overcome obstacles to routinization of the practice.

As the four different groups of transfer methods appear to target different types of transfer issues, it seems logical that each group of methods would have a differential effect on the stickiness of the different transfer stages. What follows, then, is an explication of the two dimensions with predictions as to how they will affect stickiness in each of the transfer stages.
3.6.2. Effect of the Four Quadrants

Effect of Persuasion Only Methods on Stickiness. As mentioned previously, organizations often have difficulty persuading recipient units to adopt new practices because of resistance to change. Resistance is a natural response as change often involves moving from the known to the unknown. This is particularly true in the case of transferring practices during the initiation phase as lack of experience combined with information impactedness (Williamson, 1975) inhibits a recipient from understanding a new practice prior to at least the implementation stage where information about the practice is shared in volume by the source.

Assuming that one is transferring practices that obtain superior results, the use of methods that demonstrate those results, supporting the appropriateness of the transfer, and that provide evidence that someone else in the organization has already successfully implemented the practice, supporting the efficacy of the practice, should decrease resistance to change. As resistance to change most often occurs prior to the adoption of a practice one would thus expect the use of persuasion methods to significantly reduce the incidence of stickiness during the initiation stage of a transfer when the decision to implement is being made.

Likewise, persuasion may play a role during the transfer and ramp-up stages if a subset of employees were not initially persuaded or if additional persuasion is necessary in response to initial transfer difficulties. However, given limitations on time, effort, and finances, use of persuasion methods during these stages could also inhibit the use of

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methods more useful, thereby increasing stickiness as well. Hence, both a facilitative and an inhibitory effect may be at work for the central stages, suggesting a net null effect. During the final stage, the institutionalization stage, the practice is fully operational and achieving positive results. While there might continue to be a need for persuasion, particularly in response to getting employees to institutionalize the practice, one would expect much less need for it (good results are already being achieved). Given the risk of displacing other methods one would predict an increase in stickiness during this stage if persuasion methods are used.

The prediction for the effect of utilizing persuasion methods is as follows:
Initiation stickiness – decrease; Implementation stickiness – no effect; Ramp-up stickiness – no effect; Integration stickiness – increase.

*Effect of Reference Only Methods on Stickiness.* Organizational routines are often complex and at least partially causally ambiguous (Rivkin, 2000) requiring intensive use of the knowledge contained in the original practice in order to overcome implementation difficulties and ensure institutionalization of the transferred practice. Methods, such as those grouped in the reference only quadrant are thus likely to be most useful during post-initiation stages when reference to the details of the original practice are most useful. For instance, during the transfer stage transfer of detailed knowledge from the original is essential. During the ramp-up stage iterative reference to the original may be necessary to solve unforeseen implementation problems (Winter & Szulanski, 2001). During the
institutionalization stage controls instituted to ensure compliance with the original may be necessary in order to make the transferred practice legitimate and permanent.

The total effect of the reference methods, however, is not as clear cut as one might assume. One would clearly predict that reference is more important for the transfer and ramp-up stages than the initiation stage where such methods are likely to preclude the use of more appropriate persuasion methods. However, given that such methods often require intensive investments in time and resources the use of "reference only" methods may preclude the use of more balanced methods capturing both persuasion and reference. If this is the case while one would expect the effect of reference to become stronger over time, at least for the middle temporal stages, the preclusion of persuasion may negate any positive benefits resulting in a net insignificant effect during the stages where persuasion may still be important.

The prediction for the effect of utilizing Reference Only Methods is as follows: Initiation stickiness – increase; Implementation stickiness – no effect; Ramp-up stickiness – decrease; Integration stickiness – decrease.

Effect of Methods Containing Both Types on Stickiness. Given that this quadrant of methods contains elements of both persuasion and reference one would expect them to decrease stickiness during most of the stages of the transfer with the strongest effects during the middle two stages where both dimensions may be useful. However, methods high in both dimensions are likely to contain significant amounts of data and knowledge. During the initiation stage, where the need for persuasion is paramount, large quantities
of information may obfuscate the actual results the source practice obtains. Thus, during the initiation stage one may obtain a non-significant finding if the ability to persuade is dampened by the inability to easily compare results. The prediction for the effect of utilizing Both Persuasion and Reference Methods is as follows: Initiation stickiness – no effect; Implementation stickiness – decrease; Ramp-up stickiness – decrease; Integration stickiness – decrease.

Effect of Methods Containing Neither Type on Stickiness. Following the logic that knowledge transfer methods require intensive investment that may preclude using too many multiple methods simultaneously we predict that the use of this set of methods will increase stickiness during all stages of the transfer process. The prediction for the effect of utilizing Neither Persuasion Nor Reference Methods is as follows: Initiation stickiness – increase; Implementation stickiness – increase; Ramp-up stickiness – increase; Integration stickiness – increase.

3.6.3. Construction of Measures

Stickiness, for this analysis, is measured as stickiness at each of the separate temporal stages of transfer resulting in four sequential measures of stickiness. The survey questions are reproduced in Appendix A. The measures of method utilization were constructed by creating variables for each transfer indicating whether or not methods within each of the four quadrants had been used. The measurement of the methods themselves was detailed in section 3.2.1. We also included a series of controls which have been found to be predictors of the stickiness of organizational practice.
transfers in previous work (see Szulanski, 1996 for a theoretical justification). They include the source and recipient’s motivation, the reliability of the source, the recipient’s absorptive and retentive capacity, causal ambiguity, the proveness of the knowledge transferred, and elements of the social context, i.e.; the ease of the relationship and the fertility of the context. As this work is exploratory and only eight firms were involved in the survey, we also added dummy variables to control for firm specific effects. Finally, using the Kogut and Singh measure (1988), we included cultural distance as previous research has predicted that increased cultural distances between source and recipients will increase the difficulty of the transfer (Jensen & Szulanski, 2004; Kostova, 1999). The reliability, unidimensionality, and discriminant validity of the control variables is reported in earlier work (cf. Jensen & Szulanski, 2004; Szulanski, 1996).

Table 8 reports the correlations between stickiness, the control variables, and the four quadrants.
Table 8: Correlations between Stickiness, Method Quadrants, and Control Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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* Italicized coefficients are significant at p<.05 or better.
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<td>-.18</td>
<td>-.25</td>
<td>.02</td>
<td>.11</td>
<td>-.03</td>
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</tbody>
</table>

*Italicized coefficients are significant at p<.05 or better.

3.6.4. Analysis

To explore the effects of the dimensions we used regression with the following model:

\[ Stickiness_i = \beta_0 + \beta_1 \text{Persuasion Methods} + \beta_2 \text{Reference Methods} + \beta_3 \text{Both Methods} + \beta_4 \text{Neither Methods} + \beta_5 \text{Control Variable} + \ldots + \beta_n \text{Control Variable} + \epsilon_i, \]

where \(i\) indicates a specific temporal stage of transfer and \(\epsilon \sim iid N(0,1)\).

Model one regresses initiation stickiness on the control and independent variables while models two through four do the same for transfer, ramp-up, and integration stickiness. While we are estimating multiple models OLS, rather than Seemingly
Unrelated Regression, is used to fit the models. When the set of independent variables is the same across all models both types of regression return the same results (Zellner, 1962).

3.6.5. Results

The results for the regression analysis are reported in Table 9.

| Table 9: Regression of Method Quadrants on Stickiness |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
| Stickiness                      | Initiation      | Transfer        | Ramp-up         | Integration     |
| Persuasion Methods              | -.309* (2.57)   | -.062 (-0.49)   | -.096 (-0.77)   | .258* (2.23)    |
| Reference Methods               | .320* (2.49)    | .182 (1.37)     | .215 (1.66)     | -.328** (-2.70) |
| Both Methods                    | .103 (0.88)     | -.452*** (-3.83)| -.352** (-3.04)| -.428*** (-4.02)|
| Neither Methods                 | -.184 (-1.52)   | .300* (2.36)    | .508*** (4.107) | .495*** (4.37)  |
| Source’s Motivation             | -.267* (-2.50)  | -.236* (-2.19)  | -.242* (-2.31)  | -.205* (-2.05)  |
| Source Reliability              | -.193^ (-1.88)  | .017 (0.16)     | -.248* (-2.42)  | .214* (2.16)    |
| Context                         | .072 (0.77)     | -.032 (-0.36)   | -.104 (-1.12)   | -.184* (-2.29)  |
| Causal Ambiguity                | .127 (1.12)     | .052 (0.45)     | -.203^ (-1.79)  | .307** (2.83)   |
| Knowledge Proveness             | -.255** (-2.69) | .007 (0.07)     | .061 (0.64)     | .137 (1.58)     |
| Recipient’s Motivation          | -.018 (-0.18)   | -.093 (-0.90)   | .077 (0.77)     | -.028 (-0.30)   |
| Absorptive Capacity             | -.171 (-1.51)   | -.546*** (-4.58)| -.248* (-2.10)  | -.539*** (-5.07)|
| Retentive Capacity              | .068 (0.59)     | .181 (1.51)     | .045 (0.39)     | .127 (1.20)     |
| Relationship                    | -.170^ (-1.92)  | -.147 (-1.65)   | -.250** (-2.85) | -.182* (-2.27)  |
| Cultural Distance               | -.079 (-0.75)   | .035 (0.32)     | -.009 (-0.08)   | .109 (1.10)     |
| Firm dummies                    | Entered         | Entered         | Entered         | Entered         |

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Table 9 Continued

<table>
<thead>
<tr>
<th>Stickiness</th>
<th>Initiation</th>
<th>Transfer</th>
<th>Ramp-up</th>
<th>Integration</th>
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</thead>
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<td>112</td>
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</table>

Coefficients are standardized beta coefficients. t-values are in parentheses.

*** Significant at p<.001 level, ** Significant at p<.01 level,
* Significant at p<.05 level, ^Significant at p<.1 level

All four models are significant with F statistics ranging from 5.69 for model two to 8.32 for model four. As well, the adjusted R squared statistic ranges from .46 for model two to .58 for model four.

Nearly all of the categories of methods, Persuasion Only, Reference Only, Both, and Neither have the expected sign and nearly are significant where predicted. As expected, the use of Persuasion methods significantly decreases stickiness during initiation (beta of -.309, p<.05) while the use of Reference methods increases it (beta .320, p<.05), and methods high in Both dimensions are non-significant. While we predicted that methods low in both dimensions would increase stickiness because of the time and effort taken to utilize them, the result was non-significant.

Likewise, as expected, during the transfer stage the use of Reference or Persuasion methods results in non-significant findings. Also as expected, the use of
methods high in Both decreases stickiness (beta -0.452, p<.001) while those low in both (Neither) increases it (beta 0.300*, p<.05).

During the Ramp-up stage Persuasion methods still have no effect, methods high in Both significantly decrease stickiness (beta -0.352, p<.01) and those low in both (Neither) increase it (beta 0.508, p<.001). However, while we predicted that Reference only methods would also decrease stickiness the finding was non-significant. This may be a result of the necessity of including some persuasion during the Ramp-up stage, or, the fact that the methods clustered in the upper left of the dimensional space are concentrated on control procedures meant to establish the practice more fully at the recipient site. As such, practices with only a Reference component may be most significant during the integration stage.

Finally, during the integration stage all quadrants performed as predicted. Persuasion Only methods significantly increased stickiness (beta 0.258, p<.05), Reference Only methods decreased it (beta -0.328, p<.01), methods high in Both decreased it (beta -0.428, p<.001), while those low in both (Neither) significantly increased it (beta 0.495, p<.001).

Construct validity hinges on comparing the predicted vs. actual pattern of results. Table 10, below, summarizes this, concluding that there is sufficient reason to suggest construct validity, allowing us to thus conclude that Persuasion and Reference are indeed the mechanisms underlying the various methods for increasing the effectiveness of knowledge transfer.
Table 10: Transfer Methods Prediction vs. Actual

<table>
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<tr>
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<th>Integration</th>
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<tr>
<td>Ref. Only</td>
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<tr>
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<tr>
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<td>+</td>
<td>0</td>
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</tbody>
</table>

To conclude this section we consider the control variables. The control variables, when significant, have the expected sign except in two instances, that of source reliability during the integration stage and causal ambiguity during the ramp-up stage. In general the source’s motivation decreases stickiness during all stages because it reflects the desire of the source to exchange knowledge thus increasing the effective amount of opinion and explanatory information transferred to the recipient (Berger & Kellerman, 1983). The reliability of the source, likewise decreases stickiness during the first three stages as a reliable source is likely to inspire greater trust, thereby increasing the likelihood of adopting a source’s practice and accepting and implementing its transferred knowledge (Mayer et al., 1995). During the integration stage it is possible that if the source is perceived as reliable the recipient will not take the actions necessary to fully integrate the practice, actions which may require some adaptation. A context that encourages the transfer of practices is likely to aid in the integration of such practices. Causal ambiguity
is generally expected to increase stickiness because of the difficulty of understanding exactly what to transfer (Lippman & Rumelt, 1982). It is uncertain why causal ambiguity may decrease stickiness during the ramp-up stage although such a finding is marginal. Knowledge proveness should decrease stickiness during initiation by increasing trust in the efficacy of the practice. A recipient’s absorptive capacity aids the recipient in implementing new knowledge thus decreasing stickiness during the later stages of a transfer. Finally, an easy relationship may be considered to decrease stickiness throughout the transfer by allowing for easier exchange.

3.6.6. Alternative Explanations

It is still possible that we have mislabeled the underlying constructs and that they refer to something yet to be identified. For instance, the “Reference” dimensions appears to contain many methods aimed at establishing procedures while the “Persuasion” dimension contains many methods that involve primarily interpersonal contact. Potentially the dimensions should be labeled the “Procedural” and “Interpersonal” dimensions. Indeed, theoretically, one might expect Procedural methods to be useful later in the transfer process and Interpersonal ones to be useful earlier, much as we hypothesize with the Persuasion and Reference dimensions.

However, in both of these cases there are sufficient non-corresponding methods to make this interpretation less likely. Specifically, Corporate Setting Policy based on Best Practice (#13: 1.52, -.08), which is on the right hand margin of dimension 1, while containing persuasive elements, is relatively impersonal, as is TQM (#37: .80, -.73),
Videos (#7: .60, -1.05), and Lead Unit (#20: .41, -.67) designations. Likewise Conventions (#11: -.96, .32), Presentations (#28: -.65, .11), Conferences (#9: -1.00, .18), Short Visits (#27: 2.25, .27), and Help from Other Units (#16: .77, .75), while all above the zero mark for dimension two do not contain significant elements of establishing procedures.

Of course, other potential interpretations could be developed. However, the nomological validation of our interpretation was strongly significant, i.e.; the hypothesized results matched the regression results closely. For an alternative explanation to supplant Reference and Persuasion the match between a theoretical influence on stickiness and the subsequent regression results would have to be nearly perfect. While we cannot rule out such a possibility we know of no other interpretation that accounts as well allowing us to conclude that Reference and Persuasion are, indeed, the primary dimensions underlying attempts to transfer sticky organizational practices.

3.7. Discussion and Conclusion

This study resulted in a number of findings regarding the dimensions underlying methods for transferring organizational practices and their influence on the effectiveness of knowledge transfer. The study validated that many of the methods discussed in the general knowledge transfer literature apply specifically to transfers of organizational practices. The primary contribution of this chapter, however, is in identifying the naturally emergent dimensions which under-gird the various methods for increasing the effectiveness of knowledge transfer. This is important in moving toward a more unified
and parsimonious explanation of the dynamics behind the use of different transfer methods.

The multidimensional scaling results suggest that there are two dimensions underlying the 38 different transfer methods. These are identified as Persuasion and Reference. While the Reference dimension has been theoretically connected to knowledge transfer in the literature the Persuasion dimension has only been loosely, if at all, connected. This research substantiates the importance of Reference while including the critical nature of Persuasion in transferring organizational practices.

In addition to demonstrating the existence of different dimensions we explored the influence of the dimensions on the effectiveness of transfer across the four temporal stages of organizational practice transfers: the initiation, implementation, ramp-up, and integration stages (Szulanski, 2000b) by subdividing the two dimensions into four quadrants (Persuasion Only, Reference Only, methods high in both, and methods low in Both) and regressing these, along with a set of control variables, on stickiness at each stage of the transfer process. This portion of the analysis establishes the validity of the two dimensions by matching a theoretically predicted pattern to the actual pattern observed in the data (Trochim, 2001). The validity of the dimensions is adequately established as the predicted and actual patterns correspond closely. Moreover, the analysis highlights the importance of Persuasion throughout the transfer as the group of methods most likely to reduce stickiness during the latter three stages were those
involving both Persuasion and Reference, suggesting that persuasion is critical not just for adoption, but for subsequent implementation as well.

The analysis also establishes a contingency factor, the timing of method usage, which suggests a differential effect of using different method types at different times of the transfer. This is an important contribution as the literature, with few exceptions (Chai et al., 2003), has suggested that all indicated methods have a positive impact on transfer effectiveness with differences in performance due solely to differential use of the indicated methods. Our analysis, however, suggests that this is not always true. The usage of some types of methods at inappropriate times not only does not contribute to transfer effectiveness but may actually increase the difficulty of the transfer. Specifically, our analysis suggests that using Reference methods during the initiation stage may increase the stickiness, or difficulty, of transfer while using Persuasion methods during the integration stage may also increase stickiness. Likewise, using methods low in both dimensions is likely to increase stickiness during most of the stages of transfer. Not only do these findings have implications for the academic literature but they have direct practical implications as well, specifically in the advice given to practitioners as to the timing and the purpose of using specific transfer methods.

The findings, however, should be applied with some caution. First, the findings apply primarily to intra-firm transfers of organizational practices. While the dynamics of inter-firm transfers and transfers of technology are, in some respects, similar it is likely that specific methods operate at least somewhat differently in those types of transfers and
that different sets of methods are utilized. Second, the research design is cross-sectional in nature. While this is sufficient for multidimensional scaling it limits the ability to draw strong causal inferences from the regression analysis. However, data collected through a cross-sectional survey can still be valuable for the analysis of temporal stages because longitudinal archival data is virtually non-existent and most current longitudinal studies examining the transfer process span only a few transfers within a single firm. Moreover, observations taken through a fixed-interval periodic survey tend not to be compatible because the specific meaning of complex measures is sensitive to the stage of the transfer where the measurements were taken. A fixed-interval, periodic survey may miss important data if transfers are not synchronized, interval sampling is too long, or when respondents' participation changes during the transfer (Leonard-Barton, 1990). Cross-sectional surveys are not subject to these difficulties.

Caution should also be applied for practice in using the MDS plot to determine which methods should be used in a replication effort. Specifically, the data does not indicate the degree to which practices may be substitutes or complements of each other. In other words, it may not be sufficient to randomly use a single practice high in the Persuasion mechanism at the beginning of a transfer effort if that method is dependent upon the use of a complementary method as well. Indeed, one may suppose that certain configurations of methods are most appropriate at different stages in the transfer. For instance, a set of purely persuasive methods may be most efficacious at the beginning of the transfer with the appropriate mix shifting slowly toward reference methods in later
stages. Likewise, during the implementation stage of a transfer one could imagine a set of Persuasive methods focused on interpersonal contacts, such as Short Visits, augmented by the use of a Reference method containing information which might focus the visit, such as Best Practice Manuals.

A preliminary way of addressing this issue is through a correlation matrix (included in Appendix B) that measures likelihood of co-occurrence of methods. If methods are highly positively correlated they may be complements. If they locate in the same MDS quadrant and are highly negatively correlated they may be rivalrous substitutes. Of course, this analysis is only preliminary as it does not indicate whether they truly are complements/substitutes or only co-occur. Additional research is needed to completely explicate the relationships among methods.

Despite the study's limitations, given the early stage of the literature in this area this chapter potentially makes a contribution toward understanding the dynamics of replicating organizational practices. Specifically, it grounds the discussion in observable actions taken during transfers while providing an understanding of the theoretical constructs underlying those actions. Of particular note in this regard are the findings that the constructs of Persuasion and Reference not only characterize specific types of transfers but play a significant role in determining the effectiveness of the transfer. These two constructs have received little empirical attention in the academic literature on transfer methods and the Persuasion mechanism has typically been overlooked in the more general knowledge transfer literature.
Not only is the elucidation of the Persuasion mechanism valuable for the knowledge transfer literature but specifically for the replication literature which, to date, has focused almost exclusively on the role of reference during the replication process (e.g., Winter & Szulanski, 2001). For instance, the existence of a template has been hypothesized to be a significant determinant of replication success with the causal mechanism the ability to refer to the template to solve unforeseen implementation problems (Winter & Szulanski, 2001). However, the second chapter of this dissertation suggests that templates may play not only the role of referent but persuader as well, something which is corroborated by this research.

This richer explication of templates extends their role from implementation only to the initiation stages of replication as well. This increased understanding also contributes to the debate on the balance between imitation and replication. Templates provide the proof that replication is both appropriate and feasible. While potential imitators may be able to monitor superior results to some extent, without access to direct observation they will be unable to ascertain the efficacy or feasibility of copying the practice. Thus, one would expect the persuasive element of templates, as well as the referential element, to have a differential effect on imitators vs. replicator. Replicators should not only be more successful at copying their own practices but may be more likely, as well, to initiate the copy effort in the first place.

Not only does an understanding of the underlying dimensions affect the construct of templates but that of stickiness as well. Traditionally stickiness, or transfer difficulty,
has been treated as a single construct. The analysis here, however, suggests that stickiness may actually consist of two constructs, persuasion stickiness and reference stickiness, each with their own mechanisms of operation and methods for overcoming them. While these two potential types of stickiness are somewhat time dependent there is significant temporal overlap indicating they may be separate constructs. Moreover, the analysis suggests that specific methods for overcoming one type of stickiness may be contributors to the other.

In general this chapter contributes to our understanding of how competitive advantage flows from knowledge assets (Teece, 1998) by detailing some of the micro-dynamics of the replication of organizational routines. Such transfers have been argued to be at the heart of obtaining competitive advantage from firm knowledge assets (Teece et al., 1997; Winter, 1995) making their study of imminent concern. We trust that this chapter begins to fill that gap. Moreover, the findings suggest that future research in this area needs to account for the Persuasion and Reference mechanisms. Future research might also begin to map out other factors, beyond the timing of method usage, that moderate the success or failure of each underlying mechanism. Given that competitive advantage in open economies flows from the ability to leverage knowledge assets, a better understanding of the mechanisms underlying such transfers is likely to be a valuable addition to both research and practice.
4. Variation through Replication: The Extent, Consequences, and Sources of Unit Variance under Replication Strategy

4.1. Introduction

In this chapter we extend replication theory (Winter & Szulanski, 2001) by theoretically and empirically examining the extent, determinants, and performance consequences of variation in firms that utilize a strategy of replication, specifically variation in fundamental routines which we shall refer to both as variation and adaptation hereafter. Adaptation, in this, sense does not necessarily infer intentionality. Although it may contain significant elements of intention, we use the term to refer to change of any kind to firm routines, whether the change arises from intention, "drift" (Knott, 2001), or is directly induced by the environment. This usage reflects the idea that routines are operated by humans and that the majority of change requires human action, whether passive or active, resulting in human caused modification to the original routine. In addition, the term has widespread usage and its use here is intended to connect the discussion on variation to the broader literature.

While the previous two chapters addressed aspects of the process of replication this chapter addresses the effects of replication when it is repeatedly employed. In this chapter we explore variation in replicator systems since variation is an essential part of firm innovation and change. Moreover, there is some controversy as to whether or not replicator firms will exhibit sufficient degrees of internal variation to allow for firm innovation, and hence, firm survival in changing environments. If they do not,
replication strategy is likely to be of little use to any firm except those in stable environments or those wishing to only succeed for a short time. The potential for extensive internal variation belies conventional wisdom in the management field and may provide a basis for understanding change and innovation in such firms despite an intensive firm level focus on the exploitation of existing knowledge assets and the inertia associated with such a focus.

Typically, replication has been conceived of as a simple process entailing the repeated application of a clever business model across geographic space resulting in an extreme form of exploitation commonly referred to as “cookie-cutter” strategy. Indeed, while some have argued that while the initial creation of a suitable business model for replication involves a period of innovation and exploration (Winter & Szulanski, 2001), once that period is complete the repeated exploitation of an existing business model is argued to result in difficulties commonly associated with exploitation (Winter & Szulanski, 2001) including competency traps (Lee et al., 2003; Levinthal & March, 1993), organizational inertia (Crossan & Berdrow, 2003; March, 1991), and the inability to adapt to changing conditions (Miller, 1993). Organizational inertia due to replication is further compounded by a strong firm incentive to reduce unit level variation in order to maintain control over branding and capture efficiencies from operating a system of similar units such as economies of scale in purchasing, training and monitoring, and the ability to more easily introduce incremental change.
Inertia, either by choice because of firm incentives or as a result of the basic strategy, however, would suggest that most firms employing replication as a strategy should expand rapidly and then stagnate and decay in existing markets with new firms gaining market share at a brisk pace. Indeed, the inhibited variation inherent in extensive exploitation suggests that, following the fundamental theorem of natural selection (Fisher, 1929), firms with greater ability to change, and hence greater variation, are likely to have competitive superiority, something belied by the growth of this type of firm. Even a short survey of replicator firms and industries where replication strategy dominates suggests, however, that while some firms grow quickly and then fail to change with the environment (which occurs with firms employing other strategies as well) many replicator firms appear to be vibrant over a long period of time. In many representative industries there is relatively little churn among leading firms. Such anecdotal evidence suggests the need to more closely study the “exploitation” phase of replication strategy.

If firms employing a replication strategy continue to survive and even thrive in turbulent environments they must possess a mechanism for change. Two possibilities exist. First, the center may possess both the dynamic capabilities necessary to learn and alter the fundamental business model as well as capabilities for transferring that model both to existing and new units. Second, a replicator firm, as a system of similar units, may exhibit variance in fundamental routines leading either to change through unit level selection or unit level learning and the diffusion of practices. Both possibilities may exist simultaneously. The existence of either type of mechanism for change extends...
replication strategy from the process of replication itself to the ongoing management of a changing network requiring both the management of variation both during the initial replication process and later as well as the repeated replication of newly developed practices.

Of course, while conventional wisdom in the management literature consigns replicator firms to a category of low variation because of extensive replication there are dissenting voices. For instance, in the economics literature one of the primary motivations for franchising is argued to be increased local adaptation, and assumed profit maximization, due to local agents being owners as well as managers (Jensen & Meckling, 1976; Minkler, 1992; Rubin, 1978). In addition, previous work in organization theory, while not replicator specific, argues that local units, especially in international contexts, will adapt in order to fit local institutional and market environments (Hannon et al., 1995; Kostova & Roth, 2002), creating variation within the firm. Indeed, there is a longstanding debate over the benefits and extent of standardized practices vs. practices tailored to be locally responsive (Bartlett & Ghoshal, 1989; Prahalad & Doz, 1987) with some arguing that change originates from practices which vary at the periphery of the organization rather than from dynamic capabilities at the center (Andersson & Forsgren, 2000).

In practice one is not likely to find either the extreme of conventional wisdom, with little to no variation, or the extreme where all units are adapted completely to their varied environments. Indeed, one may find a differential pattern of inertia and change.
depending on the level of analysis, center vs. units. Clearly some unit level adaptation is likely to occur as units attempt to maximize their local potential. However, the center has an incentive to maintain a tightly controlled standardized business model in order to 1) maintain branding, 2) provide efficiencies both in economies of scale in purchasing and marketing, and 3) reduce learning and monitoring costs (Blair & Lafontaine, 2005; Bradach, 1998), an incentive which is complicated both by the difficulty of enforcing strict adherence to a standardized business model (Knott, 2001), the cost of enforcing adherence (Blair & Lafontaine, 2005), and the degree to which local maximization attempts create system-wide diminishing returns, i.e.; at lower levels of adaptation variation may result in a net positive for the system as a whole. Such questions suggest the need to examine more closely the issue of variation in replicator organizations.

Perhaps due to the difficulty of obtaining quality intra-firm data in significant quantity, even within the literature suggesting that intra-firm variation is likely there is little empirical evidence describing the extent, effects, and causes of variation within replicator firms. This chapter seeks to fill that gap by asking three fundamental questions 1) how much variation is there within replicator firms, 2) why should replicator firms care about the level of variation, and 3) if variation matters, where does it come from? If variation has performance consequences, an answer to the third question may potentially provide actionable levers for managing that variation.

To adequately address the questions we use a unique intra-firm dataset involving 11 years of monthly performance and product mix data for a census of all U.S. units.
(approximately 3,500) within a single replicator firm supplemented with extensive firm archival data for a sample of units. This data allows us to track changes in total variation for a series of dependent variables measuring changes both in performance and the fundamental routines comprising the replicated business model. Specifically, we track variation at the center and partition total variation into two component levels, within-unit and between-unit variation. In addition, using the archival data, we partition each level into its potential antecedents, providing a more nuanced discussion of the nature of the variation and suggesting a series of strategic implications for replicator firms. Answering all three questions has the potential to expand the debate within the management literature concerning replicator organizations, providing an empirical foundation for future research on the nature of change within such firms.

The first task, then, is to assess the extent of variation. The first section of the chapter shows empirically that replicator firms, despite their focus on exploiting existing knowledge, can exhibit a high degree of unit level variation along a number of dimensions including performance, the alteration of the existing business model, and the creation of new routines. The second task is to explore the effects of the observed variation using methods for analyzing panel data. Finally, the third task, using hierarchical linear modeling, is to explore the determinants of the variation, including their relative effects. Finally, we conclude by discussing the potential implications of the analyses for the competitive advantage of replicator firms.
4.2. The Extent of Variation in Replicator Firms

4.2.1. Variation and Firm Evolution

Firm survival in turbulent environments is dependent on firm evolution. As firms are conceived as a collection of routines, firm evolution is dependent on variation in firm routines (Miner, 1994; Nelson & Winter, 1982). Some have concluded that, due to inertial forces, firms are not often able to vary internal routines and selection occurs in populations (Carroll & Hannan, 2000; Hannan & Freeman, 1989). Others have concluded that some firms possess the dynamic capabilities necessary to alter fundamental firm routines (Rindova & Kotha, 2001; Teece et al., 1997; Zott, 2003).

Conventional wisdom, however, indicates that replicator organizations will not be among the population capable of easily varying internal routines, and as such will live and die subject to population selection forces. Indeed, March's (1991) work on exploration/exploitation suggests that replicator organizations will exhibit strong tendencies toward inertia as a result of a constant focus on the exploitation of existing knowledge.

Our work with replicator organizations provides some proof for this hypothesis. For example, the firm studied in this chapter only undertook one major change initiative in the 11 years of the study. The change initiative, moreover, involved only changes in colors and signage for local units rather than changes to fundamental routines. While there were incremental changes to recruiting, monitoring, and training methods little was done to alter the basic business model during the period of observation.
Organizational evolution, however, involves not just the headquarters, but nested systems at increasing levels of analysis (Aldrich, 1979; Miner, 1994; Singh & Lumsden, 1990). Replicator organizations, specifically, consist of 1) a central headquarters unit tasked with the initial development of the business model (Winter & Szulanski, 2001) and the ongoing replication and support of that model and 2) local units tasked with the implementation and daily operation of that basic model. Because replicator organizations operate many units simultaneously across nested levels of analysis, intra-organizational evolution may be initiated in three ways, temporal variation in the center, temporal variation at the unit level, or geographic variation at the unit level (Croonen, 2004). Of course, in practice one is not likely to find either the extreme of conventional wisdom, with little to no variation in the entire system, or the extreme where all units are adapted completely to their varied environments. Indeed, one may find a differential pattern of inertia and change depending on the level of analysis, center vs. units.

4.2.2. Patterns of Variation

The potential for variation at different levels of analysis results in a number of potential categorical patterns of variation in replicator firms. First, is that of little or no variation (see part A, figure 3). This pattern most closely resembles conventional wisdom which suggests that replicator organizations are examples of firms that are likely to exhibit inertia as they compete primarily through the exploitation of existing knowledge. The headquarters, or central organization, may conform to this expectation as its predominant routines involve the repeated replication of, support for, and control of
a stable business model (Bradach, 1998; Winter & Szulanski, 2001). Individual units, especially if they are subject to competency traps arising from repeating the success of the original model, may also exhibit inertia (Levinthal & March, 1993) resulting in little unit level temporal variation. Of course, for this pattern to occur any replicated units would have to maintain the integrity of the transferred routines, with little or no adaptation, and be situated in similar environments so as to expect equivalent performance.

The second potential pattern is for a firm with little system-wide variance which, over time, changes creating firm-wide temporal variance in fundamental routines (see part B, figure 3). For this pattern to exist, first, the center must not be bound by inertia despite its focus on replication. Second, it must possess the capabilities not only to innovate but to transfer that innovation concurrently to existing and new replicated units without mutation. Finally, it must possess monitoring and control capabilities to minimize variation between units. This pattern would exist if the center were to alter the entire system to adapt to a changing environment.

The third pattern is a system where the center remains stationary while its units, as a block, change. This pattern might occur in a situation where the center is bound by inertial forces and all units operate in the same environment yet there are changes in that environment such that the standardized routines transferred by the center no longer maximize profits. In such a situation the units will have an incentive to maximize local profits by fitting the environment more closely. Assuming that the units are not bound by
the same inertial forces as the center, we expect that the units would then shift toward the new environment while the center remained in place (see part C, figure 3).

The fourth pattern is similar to the first, exhibiting little inter temporal variance, except that the units, while possessing inertia either because of competency traps or a strict monitoring regime, are scattered across the landscape and have been altered to fit their local environments. In this scenario you would have a moribund center and geographic variation between moribund units (see part D, figure 3).

The final pattern might occur if the replicated units operate in different circumstances and are not bound by inertia. This is similar to pattern three in that the units find themselves in an environment different from that in which the center originated the standardized, transferred routines. In this case, given that individual units operate in varying conditions one may find a differential pattern of movement. Some units may focus on exploitation of the transferred business model to the exclusion of local optimization. Other units, however, especially given incentives for local owner/mangers to maximize local profits (Jensen & Meckling, 1976; Sorenson & Sorensen, 2001) are likely to attempt to adapt the system to their circumstances. Given that conditions are likely to vary, such adaptations may also vary in terms of both the rate and direction of movement in the landscape, producing, over time, both unit level temporal and geographic dispersion in the system as a whole. Such movement may be a mixture of both random and systematic, intentional movement and may, over time, shift the center of
the system’s gravity depending on the direction of each unit’s movement (see part E, figure 3).

Figure 3 below illustrates the basic categories of variation.

**Figure 3: Patterns of Variation in Replicator Firms**

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<td>T 1 &amp; 2</td>
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The first empirical task, then, is to describe the variation in a system originating from a strategy of replication.

4.2.3. Sample

What is described below is the variation across time for two proxies of unit level routines, deviation from a recommended product mix and the percent of revenue generated from non-standard products (not part of the business model transferred by headquarters). For each unit the routines in question were transferred in a standardized
manner from the center with specific recommendations and guidelines as to their implementation. As such, the measures are also a proxy for conformity to centrally standardized routines. Given that the firm in question is a service firm, deviation from the recommended product mix represents variation derived from the recombination or reordering in importance of existing routines. The extent of revenue from non-standard products represents variation in the introduction of new routines. As well, we include a description of the variation in performance as an outcome variable providing additional description of the overall level of variation in the firm.

The data are obtained from a single, large, non-food franchise organization, consisting of monthly indicators for all three variables for an 11 year period (1991 to 2001) for all U.S. units (approximately 3,500), for a total of 331,897 observations. The firm was considered suitable for studying variation in replicator organizations as it was similar in operations and growth patterns to a variety of other types of replicator, especially franchise, organizations, was old enough to have established itself and yet young enough to be continuing growth with the same model and structure over the entire period of observation, had sufficient number of units for study, and made available a sufficient quantity of quality data. While there are obvious limitations to studying a single franchise organization, including generalizability, issues of non-comparability of routines across firms coupled with the traditional difficulty of obtaining quality unit level data in any quantity (see Darr, 1995 and Fenwick, 1998) outweigh the potential gain from expanding the sample.
4.2.4. Variables

Ideally, one would be able to directly measure the incidence and quality of all fundamental routines across every unit, measuring variation in those activities both temporally and geographically. While such data might be obtainable on a small scale, the use of proxies for unit routines allowed us to measure variance over the entire system rather than a small subset and to tap into all routines rather than a selected few. The data for the following variables is available monthly over the 11 year period for all units in the firm.

*Deviation from the Recommended Product Mix.* The business model operated by the focal firm, as with many replicator firms, consists of a series of modular and semi-modular service products which, in turn, are the outputs of a series of subroutines. Headquarters trains new owner/managers in operating a standardized business model including explicit training and instruction in the “proper” mix of products found to be successful in the original firm outlet as well as in many of the more successful subsequent outlets, i.e.; in the amount of revenue to be generated from specific items on the menu of products or services offered. Deviation from the recommended mix results in a change in emphasis and time spent on specific routines which may, at significant levels of deviation, result in a fundamental change in the dynamics of the underlying business model, reflecting variation resulting from either the recombination of or importance accorded to existing routines.
Of course, one may argue that reordering the degree of revenue generated from
the existing menu of offerings may not constitute significant change. Indeed, one of the
most basic subroutines in retail firms involves selling what the customer seeks. At the
extreme this suggests that the local franchisee may operate in a purely passive role only
calling up subroutines that customers initiate through their demands with the resulting
product mix being solely determined by environmental influences (the degree to which
this is true is an empirical matter which we will pursue in section 4.3. where we examine
the sources of variation). Such variation may not constitute significant change but rather
flexibility within the current, standardized business model. This, however, assumes that
the changes are relatively small. At significant degrees of deviation, even if these are
driven by environmental influences, fundamental subroutines are likely to be crowded out
by otherwise minor routines, changing the underlying dynamics of the standardized
business model.

Moreover, not only may drastic deviations alter the business model but smaller
changes may also alter routines in significant yet subtle ways, potentially changing the
underlying economics of the successful, standardized model, including its appeal to
various market segments and the effects of selection forces. For instance, case work with
specific international units of the focal firm indicate that shifting the primary revenue-
generating focus by incrementally increasing the importance of the second largest
revenue generating product necessitates changes in recruiting and training practices as
well as changes in operational routines at the unit level. Such a product mix change
necessitates hiring more technologically literate franchisees who, in turn, demand a higher return on their investment thus increasing the demand for adaptation of the standardized model in order to maximize local profits.

The measure of deviation from the recommended product mix is derived by measuring the percentage of total revenue generated by each product and computing the absolute difference between these percentages and the product mix recommended by headquarters which was stable over the entire period of observation. This measure, along with the other two measures, varies by month and is available for all units in the replicator organization. To illustrate, suppose that there are two service products offered and the recommended mix suggests generating 75% of revenue from product #1 and 25% of revenue from product #2. If a particular unit generates 70% of revenue from #1 and 30% from #2 it will obtain a deviation score of 10. Such a score indicates only minor deviation. If, however, it generates 25% of revenue from product #1 and 75% from #2 it will have a score of 100. The maximum score is 200.

It should be noted that this measure, by using the absolute value (or the Euclidean distance in the subsequent analysis) does not relate to variability in the product mix itself but rather variability in the dispersion around the recommended product mix. For instance, if changes in a specific factor cause the deviation measure to go from 10 points below to 10 points above the recommended value for a specific product a deviation score of 10 will be obtained in both instances. While this creates difficulty in estimating monotonic relationships between specific independent variables and the level of sales for
a particular product type it provides a more accurate picture of variability in relation to the standardized business model.

Specifically, the measure directly anchors variability in relation to the standardized business model via the recommended product mix, i.e.; we are not interested as much in the degree of change in sales of a particular product as in the degree of difference from the overall recommended model. One could potentially utilize measures that include direction of deviation as well as magnitude in order to capture degree of change in particular product types but could not do so simultaneously for all products. Such an approach would reduce the usefulness as a measure of deviation from a complete, standardized business model. As firm evolution depends on variation from a specific point, which in this case is the standardized business model, a measure relating to variation in the dispersion around the complete, recommended product mix is considered an appropriate measure.

*Extent of Revenue from Non-Standard Products.* This variable measures variation involving the addition of new routines and is measured as a percentage of revenue attributed to non-standard products with a maximum of 100%. It should be noted that, given the nature of this measure, a description of the extent of revenue from non-standard products is likely to be conservative. Only nine non-standard products are measured in the firm archival data, some of which exist only for later years in the dataset as the product innovation occurred. Indeed, while headquarters carefully monitors all unit innovation, only those innovative attempts that prove successful and achieve prominence
in the system are reported in the central database. As such, this measure will tend to register lower levels of revenue generated from non-standard products than are likely occurring, rendering a depiction of variation more conservative than it is likely to be in practice.

**Performance.** In franchising organizations the most critical measure of performance from the perspective of the firm is sales revenue subject to royalty payments (STR). While individual unit profitability and productivity are not unimportant, royalty payments, along with initial franchise fees, are the primary source of revenue for the headquarters units. As such, royalty payments are directly connected to the level of training, monitoring, support, research and development, and, in many cases, advertising, that the central unit can undertake. Moreover, aggregate STR, minus central unit costs, is the basis for determining the profitability of the overall firm. Because of its critical nature for the firm as a whole, STR is carefully measured by franchise organizations and variations in unit level STR, and its correlates, are a primary concern for the firm. Moreover, due to an incentive to underreport as franchisees attempt to pay less in royalty fees, STR is traditionally monitored directly by the firm itself. This increases the likelihood of accurate reporting as opposed to traditional accounting figures which are often audited by third parties who do not have a direct interest in the outcome.

**Control Variables.** In detailing variation from a standardized set of routines it makes sense to control for change inducing factors which are outside the firm’s influence. The control variables we include are 1) year dummy variables to control for macro
environmental shocks and time trends, 2) month dummy variables to account for seasonal variation, 3) the age of the unit (measured as the number of days since unit opening) to control for variation due to maturation issues such as local learning and brand awareness, and 4) the number of units in the system as an increasing number of units increases the likelihood of change for a variety of reasons including accidental mutation.

4.2.5. Results

First, as we mentioned previously, partially confirming conventional wisdom and research on the effects of exploitation, we did observe significant inertia in the center. Center led change during the entire 11 years of the study consisted of only one major change initiative involving only changes in colors and signage for local units rather than changes to fundamental routines. While there were incremental changes to recruiting, monitoring, and training methods little was done by the center to alter the basic business model during the period of observation.

The units, however, did not conform to conventional wisdom. What follows is a description, for each of the variables, of the variation over time at the unit level within the focal firm.

*Variance in Deviation from the Recommended Product Mix.* Conventional wisdom suggests that due to the exploitative focus of this class of firms we should find relatively low deviation from the standard routines. However, we find significant, widespread variation around the recommended product mix suggesting variation at least in the emphasis put on specific sub-routines. The average deviation over the 11 year period is
81.1 with a minimum of 10.9 and a maximum of 196.0 out of a possible 200. In addition, the standard deviation is large with an average of 42.0, suggesting widespread dispersion around the mean in terms of the degree of deviation. While it rises for half the period then falls it remains relatively stable ending in 2001 with a higher standard deviation than in 1991. Figure 4 plots the 10th, 25th, 75th, and 90th percentiles along with the mean.

**Figure 4: Variation in Deviation from Recommended Product Mix over Time**

18 The example from the international units used earlier, which resulted in important shifts in existing routines, represented a deviation of less than 30 percentage points.

19 The sharp drop in deviation (note the 75th percentile in specific) in 1996 is due to the center implementing a new monitoring system in that year.
Absolute deviation appears to be decreasing during the period. However, the general dispersion in deviation, as measured by the standard deviation, increases for more than half the period (increasing from 33 to 44), ending with greater dispersion than at the beginning of the period. Moreover, even at its lowest point there remains substantial variation with the average unit deviating from headquarters' recommended model by over 80 percentage points. While some units operate close to the recommended model, even by the end of the period when deviation is lower, 75% of the units are 50 percentage points or more different than the recommended model. Moving just one standard deviation from the mean results in a deviation of more than 100 percentage points. Thus, even while deviation is decreasing somewhat it is persistent and significant suggesting significant levels of variation in existing routines. Accounting for factors outside of the firm's control only decreases the variance slightly.

Variance in Extent of Revenue from Non-Standard Products. One may argue that operating within the recommended product mix, even if that takes on radically different configurations, only represents minor variation in fundamental routines. As a consequence, we also measure the percentage of revenue being generated from products other than those included in the recommended model, and hence involving the addition of new routines to the existing business model. This percentage ranges from an average yearly minimum of zero to an average maximum of 98.87% (out of a possible 100%) with an average mean of 47.9%. While, as figure 5 shows, the mean, quartiles, and $10^{th}/90^{th}$ percentiles decrease over time, even by the end of the period the mean percent of
revenue being generated by other products is 22.62%, evidencing substantial variation within the firm. In addition, the standard deviation is large with an average of 27.2, suggesting as well widespread dispersion. While it rises for approximately half the period and then falls it remains relatively stable over the 11 years. Moreover, the results decrease only marginally when accounting for the control variables.

**Figure 5: Variation in % of Revenue from Non-Standard Products over Time**

![Figure 5](image)

**Variance in Performance.** By looking at variation in outcome as well we provide a more complete picture of total variation in the focal firm. As with variation in

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20 The sharp drop in deviation (note the 75th percentile in specific) in 1996 is due to the center implementing a new monitoring system in that year.
fundamental routines we also find that performance varied substantially within the firm both in terms of the ratio between high and low performers and in the standard deviation\textsuperscript{21}. The variation is persistent during the period of study, declining slightly in terms of high vs. low performers but growing in terms of relative dispersion. These differences are plotted over time in figure 6. In absolute terms they are astronomical, with an average ratio of top to bottom performers of 3993:1. Even controlling for extreme outliers $10^{th}/90^{th}$ percentile ratios average 4:1 with inter-quartile differences of 2:1. In addition the standard deviation is relatively large and grows throughout the entire period, growing 51\% with yearly growth always positive and averaging 4.6\%. The system thus exhibits widespread and growing variation in performance. While decreasing somewhat (standard deviation decreases 15.1\%) when adding the control variables, the persistent and widespread variation in performance remains. Indeed, while it is somewhat smaller it grows faster in the controlled model than in the one without the control variables, suggesting an increase in variation due to potentially controlled factors.

\textsuperscript{21} It should be noted that in reporting the results we cannot provide the actual performance figures due to the confidential nature of the data. As a consequence, the results we report have been altered by a constant. The standard deviation as well as the relationships between quartiles and high and low performers, however, remain the same.
Variation in the two variables measuring fundamental routines suggests that pattern #1 is not applicable. Even though, as we mentioned previously, we find very little change in the center during the period of study, there is clearly unit level dispersion. However, the data as presented do not indicate the relative effect of intra-unit, temporal variation vs. inter-unit, geographic variation. To do this we estimated a hierarchical linear model for each of the variables for each year, separating the variance into within-unit (intra-unit, inter-temporal) and between-unit (geographic) variation. Figure 7 plots the variance attributable to both types over time.
Figure 7 suggests there is both significant intra-unit, temporal and inter-unit, geographic variance occurring. On average, there appears to be greater geographic variation, generally increasing the dispersion in the overall system\textsuperscript{22}. However, there is significant inter-temporal variance as well suggesting that many local units are not subject to inertia indicating that, at least for the focal firm, pattern #5, representing general and moving unit variation, is the most applicable pattern.

Now that we have established that widespread and significant variation can exist in replicator organizations, the next section of the chapter will explore the potential

\textsuperscript{22} While the overall levels of variance appear to fall in later years it should be remembered that, as suggested by the previous figures, significant differences between units remained even at the end of the period of observation.
consequences of that variation. This section addresses the question of why replicator organizations should care about the level of variation within their firm.

4.3. The Performance Consequences of Variation

There are a number of potential consequences, both positive and negative, arising from unit level variation within firms that compete through a strategy of replication. First, as mentioned previously, without variation such firms will be unable to adapt, will be subject to population selection pressures, and either deteriorate or even fail as environments change. Given the turbulent global environment in which many firms operate some degree of variation, whether that is center led in terms of dynamic capabilities or at the unit level, is likely a necessity for long term competitive advantage. The requisite degree of variation is something that should be addressed with further research.

Beyond increasing survival, variation may also have positive performance implications for individual units and the firm as a whole. At the unit level, variation is reflected in adaptation of the standardized business model. Given that, in replicator firms, revenue is generated almost exclusively at the unit level the effect of such adaptation may have a direct impact on overall firm performance. Concerning the effect of adaptation on unit performance, both economists and organizational theorists argue that adaptation is necessary and will lead to superior performance by maximizing local profit opportunities (Jensen & Meckling, 1976; Minkler, 1992; Rubin, 1978) and providing necessary fit with local market and institutional forces (Bartlett & Ghoshal,
Indeed, one of the primary purposes for franchising, a subset of replicator organizations, is to increase the incentive for local management to adapt to local circumstances (Jensen & Meckling, 1976; Sorenson & Sorensen, 2001). We will empirically address this possibility, along with its negative, alternative hypothesis, below.

However, variation caused by unit level adaptation of the standardized business model may not always lead to optimized firm performance. Replicator firms accrue efficiency benefits from operating a network of similar units (Bradach, 1998). Among these benefits are increased negotiating power with buyers because of economies of scale in purchasing as well as economies of scale in training, ongoing support of units, and monitoring. Each of these advantages may increase as unit similarity increases. If units vary sufficiently the firm may not be able to purchase for all units and training, support, and monitoring costs will increase as variation requires extra time and resources to address the differences between the standardized model and the adapted one. If, as one might expect, increased costs result in a decrease in either the quality or quantity of training and support, and if training and support has an influence on unit performance (and subsequent overall firm performance), one may find that variation has a negative effect on performance.

In addition, variation may affect not only purchasing power and support costs but the system-wide common resource of branding as well. While consumers may likely tolerate a degree of difference, at even moderate levels of variation overall branding may
suffer resulting in decreased overall firm performance as some units attract fewer customers while others maximize local profits. At extreme levels, variation may destroy the value of a brand. As with the potential positive effect of allowing firm evolution, we cannot address this effect within the boundaries of this study.

While the Economics literature and Institutional Theory argue that adaptation will result in maximized unit profits this is not a foregone conclusion. Szulanski and Jensen (2006), following Winter and Szulanski (2001), suggest that adaptation may result in abandonment of the knowledge responsible for the success of the standardized business model. Because the standardized model is typically chosen to be replicated due to its successful performance, an abandonment of the underlying knowledge may result in poorer unit level performance. Of course, were local actors omniscient and able to attune their new practices to exactly fit the local environment and market needs one would not expect a decrease in performance. However, assuming that variation is not solely a result of local market demand (something we will address in the next section), local actors may not always comprehend their markets enough to adapt appropriately (Leonard-Barton, 1988; Westney, 1987).

We hypothesize that the true effect will be somewhere in the middle. It makes eminent sense, given environmental and input heterogeneity, that implementation of a standardized business model will lead to a lack of optimization for many local units, thus increasing unit performance if adaptation is undertaken. However, this is offset by the loss of system-wide benefits and the potential loss of knowledge embedded in the
standardized business model. We hypothesize a curvilinear relationship. Increasing adaptation at the unit level is likely to result in increased performance as the unit more closely fits its local environment. At high levels of adaptation, however, while fit with the market may be enhanced, the unit is likely to lose the benefit of the knowledge embedded in the standardized practice and to be sufficiently different from other units that system-wide positive effects may no longer adhere.

*Hypothesis 1: Unit level adaptation will have a curvilinear relationship with unit performance.*

Previous work on replication also suggests that the effect of variation on performance may be moderated by the timing of adaptation (Jensen & Szulanski, 2004; Szulanski & Jensen, 2006; Winter & Szulanski, 2001). In the early stages of implementing a replicated business model the local owner/manager may not comprehend the knowledge contained in the original model enough to successfully deviate. Even lower levels of adaptation at this stage may result in decreased performance as the owner/manager is not likely to fully understand the Arrow Core (Winter & Szulanski, 2001), i.e.; which aspects of the original model are essential to replicating the successful results and which are peripheral. Over time local management may come to understand the underlying dynamics of the standardized business model allowing them to adapt it to more clearly match their local environment without disrupting the key success factors. This leads to the second hypothesis:
Hypothesis 2: The interaction between unit age and unit adaptation will have a positive relationship with unit performance.

4.3.1. Sample and Measurement

The sample for this analysis is the same as that reported previously. It consists of monthly performance data for a census of all units for the period 1991-2001 supplemented with firm archival data and external data measuring environmental factors.

The dependent variable, measuring performance of the units, as detailed in section 4.2.4. is STR (sales subject to royalty). STR is considered to be an excellent measure of performance as the firm has incentives to ensure accurate reporting. The variables measuring adaptation, as detailed in same section are the logs of Deviation from the Recommended Product Mix and the Percent of Revenue Generated from Non-Standard Products. As mentioned previously these two variables measure the reordering in importance or recombination of existing routines and the addition of new routines, both measuring an aspect of adaptation of the standardized business model. Both the dependent and primary predictor variables vary by month over the 11 year period.

Control variables, factors which may also affect unit level performance, included in the analysis are month and year dummy variables, the age of each unit in number of days since opening, the region of the U.S. the unit is located in, the log of both the population and per capita income for the zip code surrounding each unit, the log of the average distance to the tenth of a mile to the nearest four units (the reasoning for the distance to the nearest four is detailed in section 4.5.), and finally, the log of the square-
footage and the location type of each unit. While square footage and location type are constant across time all other variables are time varying.

4.3.2. Analysis and Results

We tested the hypotheses using the Stata xtregar command which allows for modeling unbalanced panel data with an auto-regressive structure, which structure this data exhibits. We utilized random effects in estimating the models as fixed effects panel data estimation does not allow for non-time varying predictors. The specification is as follows:

$$Y_{it} = \alpha + X_{it}\beta + \nu t + \epsilon_{it}$$

$$\epsilon_{it} = \rho \epsilon_{i,t-1} + \eta_{it}$$

where $X$ is a vector of control and predictor variables and;

$i=1, \ldots, N; t=1, \ldots, T; |\rho|<1, \eta_{it} \sim iid(0, \sigma^2_\eta), \text{ and } \nu_t \sim iid(0, \sigma^2_\nu)$

As Table 11, below, indicates we estimated three models. First, we initially ran a baseline model containing controls which may affect the performance of units. In order to test hypothesis one, we then added the deviation and non-standard product variables including their quadratic terms\(^{23}\) to test for a curvilinear effect. Model three tests hypothesis two by adding the interaction between age and deviation and age and non-standard products. The table provides the estimates with standard errors in parentheses for each of the models.

\(^{23}\) The cubic term was also tested. For Deviation it exhibited significant multi-collinearity and did not change the shape of the curve for Non-Standard products.
Concerning the control variables, as one would expect an increase in per-capita income in the surrounding population increases unit revenue. Surprisingly, however,
population, is not a significant factor. As the distance to the nearest units increases, revenue actually decreases. While one might expect units close to one another to cannibalize customers the negative sign may indicate a decreased ability to locate and absorb new practices. As expected, as the square footage and age of the stores increase performance also increases.

Concerning adaptation, the results strongly support hypothesis one, predicting a curvilinear relationship between adaptation, for both Deviation and Non-Standard Products, and unit performance. Moderate degrees of adaptation enhance performance while large degrees of adaptation are detrimental. Figure 8 plots the curves for both measures of adaptation. As a point of reference, the mean level of the log of Deviation for the entire period was 3.42 with a standard deviation of .65. This indicates that the average unit was just below the optimum level of deviation (nadir is at approximately 3.95). The mean level of the log of Non-Standard Products was 2.67 with a standard deviation of 1.36. This indicates that the majority of units do not adapt enough in this regard. One should also note the relatively flat curve for Non-Standard products vs. that for Deviation including the flatter downward slope. This suggests that introducing Non-Standard products to the original model has significantly less effect on performance with a much smaller downside risk to large scale introductions.
As opposed to hypothesis one, concerning hypothesis two there is no evidence that the interaction between adaptation and age has a monotonic relationship with performance, that adaptation linearly becomes increasingly beneficial as units age. Instead, the interaction with Deviation is not statistically significant while that with Non-Standard Products actually indicates (although the effect is very small) that the addition of Non-Standard Products later in a unit’s life is detrimental to performance.

However, it may be that a curvilinear, or even more complex, relationship may fit the data better. Indeed, given the theoretical background presented earlier it would not be surprising to find that the interaction is limited to the early stages of a unit’s life (i.e.; the
model is relatively quickly learned allowing somewhat early adaptation) and is more sensitive to the degree of adaptation. Typically one would introduce a quadratic and, possibly, a cubic interaction term to test the potential complexity of the relationship. However, the interpretation of a quadratic interaction term includes an increase in both age and adaptation simultaneously while, in order to more thoroughly test for an effect, we should test varying levels of adaptation at multiple time periods.

4.3.3. The Interaction between Unit Age and Adaptation

In order to account for the possibility of a more complex interaction we ran an additional analysis where we created a series of dummy variables measuring degree of adaptation at specific points in time. We then estimated an additional panel data model with performance regressed on the control and dummy variables with no adaptation at month one of operation as the baseline (left out of the model).

The size of the age categories increases over time as we wanted to minimize the number of variables and expected a fine-grained effect of early adaptation. The time periods measured are indicated in the X axis of Figures 9 and 10. While we only have 11 years of data the units have been alive as long as 20 years. Thus, the age categories range from 1 month to 20 years in operation. The categories for adaptation include low, medium low, medium high, and high, corresponding to the quartiles, for the Non-Standard variable. The Deviation variable, however, contains no instances in month one (or any time period for that matter) of no adaptation. As a consequence that variable consists of only three categories, low, medium, and high with the categories drawn not
from the quartiles but equal thirds with the “no” adaptation category corresponding to the bottom 15% (i.e.; the low, medium, and high are equal thirds of the remaining 85%). Figures 9 and 10 plot the results for both adaptation variables. In order to provide a baseline for comparison in each time period (rather than always comparing to zero adaptation at the beginning of a unit’s life), we plotted the difference between the estimated effect of each level of adaptation from that of “no” adaptation for each time period beyond the first. This allowed us to measure the effect of being different from the standardized model at each time period, even if the effect of the standardized model changes over time. The plotted effect is thus the increase or decrease in the log of STR, the performance variable, caused by a specific level of adaptation in a specific time period.
Figure 9: Effect of Levels of Deviation on Performance over Age of Unit
The control variables, as expected, report the same signs and significance levels from the previous model. While, for the sake of space and brevity, we do not report the coefficients from the dummy variables, for Deviation they are significant for months 1 and 2, generally insignificant from month 3 through year 1 (except low deviation in year 1), and significant again through year 20 except for year 10 which is not significant for any level of Deviation. For Non-Standard products all are generally significant from the beginning through year 16 when all levels become insignificant.

The pattern of results suggests strong support for hypothesis two. The interaction between adaptation and age of the unit has a clear effect on unit performance. The results

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from the Deviation variable indicate that early adaptation carries a very significant negative penalty that dissipates rather quickly, only to re-emerge by year 10. Generally, both the negative and positive effects are heightened as the level of Deviation increases.

The initial negative effect corresponds well with previous work in the replication literature hypothesizing that early adaptation results in an abandonment of the template, or original practice (Szulanski & Jensen, 2006). As the figure indicates this may only be a problem during the early stages of transfer. By month six all but high levels of deviation result in positive gains in performance. The positive effect through year 10 suggests support for the hypothesis that adaptation increases performance by increasing fit with the local environment, although it is interesting to note that the effect is ultimately relatively small and is outweighed by the negative effect in the early and late periods of a unit’s life.

The negative effect following year 10 is more puzzling. The unit can be fully expected to understand the practice and its local environment well enough to successfully adapt, negating the need to refer to the knowledge contained in the original practice in order to maintain successful operations. However, one may find that older units have stagnated to some degree and failed to innovate and that adaptation decreases their ability to absorb newer practices developed either by the center or by other units.

The effect of introducing non-standard products, however, does not follow the same pattern, nor are the effects increased linearly by the degree of adaptation. Indeed, higher levels of this form of adaptation appear to result in positive gains for the very first
month of a unit’s life becoming negative very quickly, becoming positive again by year eight, and remaining steady except for high levels of non-standard products which is correlated with a decrease again after year 16. This pattern may reflect the difference between innovation in the form of altering an existing model vs. trying something new. The effect in month one may be due to the time it takes to learn the standardized business model, with the sale of alternative products more easily accessible to consumers. The sharp drop by month two may indicate a partial abandonment of the original model in favor of alternative products. While the original model may be learned fairly quickly a focus on innovation at this point may distract from mastering the original routines. Moreover, a focus on innovation suggests the need for trial and error learning which the original model obviates as it embodies past trials. This may also explain why it takes nearly eight years to gain a positive benefit from Non-Standard products. Apparently, the period of trial and error learning is significant. The decrease after year 16 for high levels of non-standard products may be due to the same factors as deviation, loss of system-wide benefits.

4.3.4. Robustness

Arguably, the degree of adaptation is not entirely exogenous, potentially being affected by performance in previous time periods. Units that are performing poorly may be more likely to engage in adaptation which may explain the observed results. Ideally, one would use an Arellano-Bond procedure to account for this problem. However, large panel data sets with dozens of time periods, such as this one, are computationally
prohibitive to estimate using this procedure. As a check, however, we estimated two models on a single subset of the data, the first using the Arellano-Bond procedure to control for endogeneity, and the second using the Stata xtregar command for estimating panel data models with an autoregressive data structure. The sign and significance level for both adaptation variables, including their squared terms, was the same for both models, suggesting that one can rely on the results of the original analysis.

It appears that variation, not accounting for the effect of adaptation on firm evolution or system-wide benefits such as branding, matters for both unit and firm performance. Not only does it matter but the relationship between the two is complicated with higher degrees of adaptation generally decreasing performance while moderate degrees increase it but only for units in a certain age range. This suggests the need to carefully monitor and manage variation, both its level and timing of incidence, at the unit level in order to maximize firm performance.

4.4. The Sources of Variation

Given that variation in the form of unit level adaptation of the original, standardized business model has significant consequences for the performance, and hence the competitive advantage, of firms employing a replication strategy the next step is to determine the sources of that variation. Once the sources of variation have been established, assuming that the firm has some control over such sources, either through placement of units, training of personnel, etc., it is potentially possible for replicator firms to manage, or control, the degree of extant variation in the overall system. Beyond
the establishment of the original business model, which involves not only the initial establishment of successful routines but the embodiment of strategic decisions such as the choice of which product markets to compete in, control of variation may well be one of the primary strategic levers available to this type of firm.

Outside of random variation, previous research on variation within firms (e.g., Nelson & Winter, 1982) suggests that such antecedents belong to two primary groups, differences in the environment and differences in available inputs to fundamental routines. Concerning unit environments, replication involves the transfer and implementation of a standardized business model that, to some extent, is likely to be non-optimized for heterogeneous environments (Sorenson & Sorensen, 2001). Because a lack of optimization suggests room for improvement it provides impetus for local adaptation in order to maximize local profits (Blair & Lafontaine, 2005; Kaufmann & Eroglu, 1998; Sorenson & Sorensen, 2001).

**Hypothesis 3: Differences in unit environments will affect unit adaptation.**

Not only is the standardized business model likely to be non-optimized for heterogeneous environments but for heterogeneous inputs as well. In most cases the template that is used for replication is situated in a particular time and place, the original having been deployed in a particular geographic location using a specific set of inputs. Conceivably the model is thus optimized for those inputs, the quality and quantity of which will vary across heterogeneous environments. The degree to which the quality and quantity of those inputs can vary without requiring change in the original model will
likely be a matter of conjecture before such heterogeneity has been encountered. Even if the acceptable range of input heterogeneity is large the operation of the standardized business model, as with heterogeneous environments, may be non-optimized unless it is adapted to fit the inputs available in any given location. This provides pressure for adaptation.

A convenient way to categorize potential inputs is as tangible and intangible inputs of which intangible inputs can be further categorized as technological, human, organizational, and relational inputs (see Fernandez et al., 2000; Hall, 1993). Technological inputs do not vary in the focal firm and are likely to only be a small source of variance in most firms as unit level technology in most replicator organizations is fairly simple and not a key performance enabler and technology which is proven to be valuable in other units usually diffuses easily within franchise firms typically leading to general parity in the use of technology (Bradach, 1998). Both tangible and other intangible inputs, however, may be important sources of variation. The value in this analysis, however, is not just establishing that a particular source creates variation, but in measuring the relative value vis a vis other potential sources.

_Hypothesis 4: Differences in unit tangible inputs will affect unit adaptation._

_Hypothesis 5a: Differences in unit human inputs will affect unit adaptation._

_Hypothesis 5b: Differences in unit organizational inputs will affect unit adaptation._

_Hypothesis 5c: Differences in unit relational inputs will affect unit adaptation._
4.4.3. Sample

The dependent variables, measuring the degree of adaptation from the standardized business model, are logged versions of those used in the first section of this chapter, Deviation from the Recommended Product Mix and Percent of Revenue Generated from Non-Standard Products, with the Deviation variable measured as the Euclidean distance rather than the absolute value. It should be noted that, concerning Deviation, we are examining the sources of variability in dispersion around the recommended product mix rather than variability in the product mix itself (see section 4.2.4 for the rationale behind the use of this measure). The independent variables are drawn primarily from firm archives covering the same period and are supplemented with commercially available environmental data for each unit locale. The firm archival data was generated by the firm for a variety of reasons at various times. Details on the nature of each measure are included in the next section. The method of analysis is hierarchical linear modeling, requiring that variables be situated at a specific level. Using hierarchical linear modeling allows us to simultaneously control for both types of variation identified in the first section of this chapter, within-unit, inter-temporal variation, and between-unit, geographic variation and to measure the relative effect of each class of antecedent on the appropriate levels of variation. Level one in the analysis captures within-unit, inter-temporal variation while level two captures between-unit, geographic variation.
4.4.4. Measures

In all cases, for the level 1 measures we employed group mean centering. Group mean centering involves standardizing within groups, a group being all observations pertaining to the same unit. For level 2 we aggregated the level 1 variables (took the mean of those that were time varying) and standardized that value. Utilizing group mean centering and standardization reduces the potential bias in the higher level predictors arising from unaccounted for lower level variance and reduces problems of multicollinearity (Ang et al., 2002; Raudenbush & Bryk, 2002). In addition, standardization is appropriate for determining whether higher level measures are significant above and beyond lower level predictors (Hofmann & Gavin, 1998).

Environmental Factors. Replicator organizations, including the one studied here, operate primarily in a retail setting, necessitating the measurement of appropriate local environmental influences. The most common measures of the local retail environment are median local income and population providing a proxy for both local customer needs and preferences and market structures (Brown, 1994; Dubelaar et al., 2002). Both measures, drawn from ESRI Inc.'s annual Sourcebook of America and Sourcebook of Zip Code Demographics, were used here. Both variables are time varying. While using zip codes as the basis for demographic information introduces some noise into the measurement it allowed for demographic information to be obtained for all units on an annual basis over the entire period of observation. The time varying population and per capita income variables were used as level 1 variables. The standardized mean of the two
was used at level 2. Culture, as well as demographics, may also create environmental
differences. Culture is proxied by a set of dummy variables measuring location in one of
five regions within the U.S.: North East, South, Mid West, West, and North West (the
dummy variable for region 5 was omitted from the analysis).

Tangible Inputs. Measures of tangible inputs were derived from firm archival
data which existed for a sample of units based on availability of data. We measure the
tangible input of unit structures as the size in square footage of each unit. Building on
prior empirical work in a retail setting land is measured as location by indicating whether
a unit is in a strip mall or another type of arrangement (Fenwick & Strombom, 1998).
Both variables are non time-varying and were used at level 2.

Human Inputs. Measures of human inputs were derived from an internal firm
survey conducted in 2000 by a marketing research firm. The survey had a 43% response
rate of all existing franchisees. Previous research in retail settings has measured human
inputs in terms of the background and previous experience of managers. Following this
line of research, we measured background in terms of managerial education level
(Fenwick & Strombom, 1998; Hise et al., 1983; McEnrue, 1988) using an eight point
ordinal scale from completing less than high school to a doctorate degree. We measured
experience in terms of industry, managerial, and ownership experience (Chandler, 1996;
Fenwick & Strombom, 1998). In specific we measured five variables indicating whether
the unit owner/manager, 1. worked at any level within a similar industry, 2. worked as a
manager in a previous business at any level of management, 3. owned a business prior to
purchasing the current franchise, 4. owned another franchise prior to purchasing the current franchise, and 5. owned a franchise in a similar industry prior to purchasing the current franchise. All five experience variables are dichotomous. All variables, including Education were non time-varying and used as level 2 measures.

Organizational Inputs. We measured organizational inputs as membership in different intermediate units. The focal franchise firm is comprised of approximately 3,500 franchise units which are overseen by 89 area units. The central organization sells area franchises with the intent that the area franchisees will sell local franchises in their specific area and oversee some of the training and monitoring of said franchises. The area units were measured through the use of dummy variables with the last area being omitted from the analysis and were used in level 2.

Relational Inputs. The potential for relationships with, and subsequently knowledge flows from, other units in the firm was measured in two ways. First we measured the number of units owned by the same owner. If a franchisee owns only one unit the value is 1. While this variable is time varying only 27% of the observations have values above 1 indicating that it should be used as a level 2 rather than level 1 variable. In other words, for a significant majority of the units this variable does not vary over time reducing its usefulness at level 1 and creating multicollinearity with its use as a level 2 variable. This variable was standardized prior to conducting analyses.

Second, we measured the potential for knowledge spillovers as the log of the aggregate number of miles between the unit and the next four units. Assumedly, units in
closer geographic proximity are more likely to share knowledge than those more distant. Previous research in knowledge spillovers between firms has measured geographic proximity in terms of co-location either in similar regions (Almeida et al., 2003; Darr & Kurtzberg, 2000), SMSA codes (Jaffe et al., 1993), empirically derived geographic clusters (Almeida & Kogut, 1999), or a mixture of region, empirical clustering, and survey items (Lublinski, 2003). However, for small retail units, which include those of the franchise firm studied here, the geographic scope for interaction with other units is likely to be relatively narrow, suggesting that distance in miles may be a more appropriate measure.

There is some question, of course, as to the appropriate number of units to include in this measure. To determine this we regressed each dependent variable on the distance variable starting with the distance to the nearest unit, then the average distance to the nearest two units, etc. up to the average distance to the nearest 10 units. While none of the distances is significant at this stage of the analysis (without the other covariates in the analysis) the t value rises dramatically at each stage (.00 for distance to nearest unit, 2nd .15, 3rd, 1.03) more or less leveling out at the average distance to the four nearest units (t value 1.15). This suggests that the most appropriate distance to include is the average to the nearest four units.

The distance data was derived from the distance between zip codes in which the units operate, was calculated to the 10th of a mile, and was allowed to vary by month as nearby units either opened or closed. While measuring from the center of zip codes
introduces some noise into the data one can expect unit location within a particular zip
code to be randomly distributed and utilizing zip codes allows for calculation of distances
between all unit pairs. The time varying variable is used as a level 1 variable. The mean
of each unit distance is used at level 2.

Control Variables. The same control variables measured in the first section were
used here as well. These include year and month dummy variables to capture macro
economic shocks, time trends, and the effect of seasonal variation, the age of local units
to capture age related issues such as local consumer awareness, and the number of units
in the system as accidental mutation and other sources of variation are likely to increase
the greater the number of units. The control variables are time varying and were included
in level 1.

4.4.5. Analysis

The models to be tested are hierarchical in nature. Both dependent variables
(Deviation and extent of Revenue from Non-Standard Products) are time varying unit
level measures while the independent variables span multiple levels. Due both to the
nested nature of the data and the desire to measure the relative effect of the independent
variables on both within and between-unit variance we adopted the hierarchical linear
modeling\(^4\) (Raudenbush & Bryk, 2002) method to describe the data using SAS Proc
Mixed to estimate the models. This method allows for the analysis of multiple levels
simultaneously, which tends to reduce biases produced by aggregating measures thus

\(^4\) See Hofmann, Griffin, and Gavin (2000) for a discussion of the use of HLM in organizations research
and Misangyi, Elms, Greckhamer, and Lepine (2006) for an example in the management literature.
providing us with a more accurate picture of the various effects. HLM is also useful in that it can handle unbalanced data, i.e.; where different units report data over differing periods of time, as is the case here, in an unbiased manner (Raudenbush & Bryk, 2002).

We utilized a reduced data set for the estimation of the models. The data set was reduced by removing all observations that have any missing data for the independent variables prior to analysis. The use of a reduced data set is desirable for two reasons. First, the size of variance components can change based on changes in sample size as a result of missing data in the independent variables. This could potentially bias an analysis seeking to analyze the relative effect of classes of independent variables. Second, when estimating HLM models a large number of missing values can result in an inability to estimate the models (Raudenbush & Bryk, 2002). Given that there are numerous missing values for many of the independent variables, up to 63%, a reduced data set was deemed appropriate. The resulting sample size is 57,215 observations. While the reduced sample is statistically different from the census due to the high power associated with large datasets, Table 12, below, which summarizes the differences, indicates that the differences are inconsequential in all cases.
<table>
<thead>
<tr>
<th>Variables</th>
<th>Data</th>
<th>Diff. in Means</th>
<th>Standard Deviation</th>
<th>N</th>
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<tbody>
<tr>
<td>Log Deviation</td>
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<td>.075</td>
<td>.650</td>
<td>57,215</td>
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<tr>
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<td>Census</td>
<td>.641</td>
<td>329,000</td>
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<tr>
<td>Log Non-Standard</td>
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<td>1.326</td>
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<tr>
<td></td>
<td>Census</td>
<td>1.347</td>
<td>328,000</td>
<td></td>
</tr>
<tr>
<td>Population</td>
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<td>14,515</td>
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<td></td>
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<td>15,446</td>
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<tr>
<td>PCI</td>
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<tr>
<td></td>
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<td>10,450</td>
<td>277,000</td>
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<tr>
<td>Distance</td>
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<td>57,215</td>
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<td></td>
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<td>86.49</td>
<td>326,000</td>
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<td>Mult. Own.</td>
<td>Reduced</td>
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<td>.799</td>
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<tr>
<td></td>
<td>Census</td>
<td>1.000</td>
<td>330,000</td>
<td></td>
</tr>
<tr>
<td>Prev. Ind.</td>
<td>Reduced</td>
<td>.001 (not sig.)</td>
<td>.402</td>
<td>57,215</td>
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<td></td>
<td>Census</td>
<td>.402</td>
<td>156,000</td>
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<tr>
<td>Mgmt Exp.</td>
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<td>Census</td>
<td>.424</td>
<td>156,000</td>
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<tr>
<td>Bus. Own.</td>
<td>Reduced</td>
<td>.001 (not sig.)</td>
<td>.467</td>
<td>57,215</td>
</tr>
<tr>
<td></td>
<td>Census</td>
<td>.467</td>
<td>156,000</td>
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</tr>
<tr>
<td>Fran. Own.</td>
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<td>.361</td>
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</tr>
<tr>
<td>Fran. Simil.</td>
<td>Reduced</td>
<td>.002 (not sig.)</td>
<td>.146</td>
<td>57,215</td>
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<td></td>
<td>Census</td>
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<td>156,000</td>
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<td>Education</td>
<td>Reduced</td>
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<td>1.336</td>
<td>57,215</td>
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<td></td>
<td>Census</td>
<td>1.329</td>
<td>156,000</td>
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<td>Loc. Type</td>
<td>Reduced</td>
<td>.010</td>
<td>.219</td>
<td>57,215</td>
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<tr>
<td></td>
<td>Census</td>
<td>.240</td>
<td>197,000</td>
<td></td>
</tr>
<tr>
<td>Sq. Footage</td>
<td>Reduced</td>
<td>20.58</td>
<td>806.78</td>
<td>57,215</td>
</tr>
<tr>
<td></td>
<td>Census</td>
<td>724.07</td>
<td>215,000</td>
<td></td>
</tr>
</tbody>
</table>

The analysis estimates a series of equations which nest repeated observations over time within units. First, a series of three null models were run for each dependent variable. The null models assessed variance in the dependent variables before accounting for any independent variables and examined the shape of the repeated data (one model each for simple, compound symmetrical (where the variances are the same at every point in time and covariances are the same), and auto regressive type 1). An auto regressive
data structure fit the data best and was used on all subsequent models. The null models provided a baseline for computing a reduction in the magnitude of the variance components associated with each level which is necessary to ascertain the relative effect of each class of antecedent. At the first level of analysis adaptation at each time period is modeled as a function of unit mean adaptation plus a random error:

\[
Y_{jt} = \beta_{0j} + \epsilon_{j,t-1}
\]

Where indices \( t \) and \( j \) denote time and unit respectively and there are \( t=1, 2, ..., T; \) time periods within units; and \( j=1, 2, ..., J \) units

and \( Y_{jt} \) is the degree of adaptation at time \( t \) within unit \( j; \) \( \beta_{0j} \) is the mean degree of adaptation (across time) of unit \( j; \) and the time-level random error, which represents variance over time, is captured by \( \epsilon_{j,t-1} \). The model assumes that \( \epsilon_{j,t-1} \) is normally distributed with a mean of zero and a variance of \( \sigma^2 \). This variance is only assumed to be uniform among the observations within each of the \( J \) units.

For the second level of analysis, the unit mean degree of adaptation, \( \beta_{0j}, \) is modeled simultaneously as an outcome varying randomly around the grand mean of all units:

\[
\beta_{0j} = \gamma_{00} + \nu_j
\]

Where \( \gamma_{00} \) the grand mean; and \( \nu_j \) is the random between-unit residual, which represents between-unit variance. It is assumed that \( \nu_j \) is normally distributed with a mean of zero and variance of \( \tau_\beta. \)
The null models partition variance in adaptation into two components: within-unit, inter-temporal, $\sigma^2$, and between-unit, geographic, $\tau_\beta$ variance. The total variance attributable to each level is calculated by taking the variance for that level divided by the total variance. The proportion of total variance for within-unit, inter-temporal Deviation is 54.6% ($p<.001$). The proportion between-units is 45.4% ($p<.001$). The proportions for Non-Standard Products are 58.0% and 42.0% respectively.

Following the null models we then estimated a model for each dependent variable which added the fixed control variables year, month, age, and number of units in the system. Only those with effects significant at the $p<.05$ level or better were included in further modeling. We then specified a set of conditional random coefficient, intercepts and slopes as outcome models (Raudenbush & Bryk, 2002) for each dependent variable, serially adding the predictors for the appropriate levels. Random coefficient models allow both intercepts and slopes to vary with HLM providing a significance test to indicate which slopes are most likely to vary randomly across units. The estimated models utilize those random effects which result in the best model fit.

The independent variables are introduced serially following the pattern of decisions used in the focal firm. First, the firm decides in which environment to locate a

---

25 The data is ultimately nested not only with repeated observations within-units but units nested in Areas which are also nested in Regions. Given this nesting structure it is possible to partition the variance in adaptation into a total of four component levels, within-unit, between-unit, between Area, and between region. However, the nature of the interpretation changes if the data is modeled this way. Whereas we are interested in testing the effect of predictors, including Region and Area, on unit level adaptation a three or four level nested structure would test the effect of various predictors on unit adaptation constrained by membership within Areas and location within Regions. In other words, for level 2, between-unit variation, rather than modeling variation across all units it would model variation only across units within Areas.
new unit, the desired region and general demographic concentration. Second, they establish the Area organization. Third, they determine approximately where within the Area franchise to place the new unit, determining how far from other units and whether or not to allow existing franchisees to purchase the contract. Fourth, they then advertise for and choose the specific franchisee to contract with. Finally, once a franchisee is chosen, the firm, in conjunction with the franchisee, determines the exact location and size of the unit. The order of entry is thus variables measuring (1) the environment, (2) organizational inputs, (3) relational inputs, (4) human inputs, and (5) tangible inputs. The independent variables are added simultaneously for both levels. When estimating the same variable for multiple levels in a serial fashion bias may occur as lower levels may reflect an effect that should be attributed to a higher level. Simultaneously estimating the same variable across multiple levels reduces this bias, although if the variable has no effect on a particular level it may occasionally increase the variance component for that level.

The specification for the full model is as follows:

Level 1: $y_{ij} = \beta_{0j} + \sum_{q=1}^{6} \beta_{1j} q_{ij} + \epsilon_{ij-1}$,

Level 2: $\beta_{ij} = \gamma_{00} + \sum_{q=1}^{14} \gamma_{0q} X_{ij} + \nu_{ij}$,

$\beta_{1j} = \gamma_{10} + \sum_{q=1}^{5} \gamma_{1q} Z_{ij} + \nu_{ij}$,

where $Y$ is Deviation for one set of models and Non-Standard Products for the other; for both dependent variables $Q$ is a vector of fixed effect control variables (year, month, age...).
of unit) and level 1 variables (population, per capita income, and distance to nearest 4 units); $X$ is a vector of level 2 variables (all independent variables other than controls); and $Z$ is a vector of those variables with slopes that vary across units (region, area, level 1 population, level 1 per capita income, and level 1 and level 2 distance to the nearest four units26).

In this set of models adaptation at time $t$ for unit $j$ ($Y_{jt}$) is regressed on the controls and time varying, level 1 predictors. The intercept for the Level 1 equation, $\beta_0$, represents mean adaptation across time for unit $j$, adjusted for the controls and level 1 predictors. $\beta_0$ is modeled simultaneously as an outcome and is regressed on those variables hypothesized to explain between-unit variance. The intercept for the Level 2 equation, $\gamma_0$, represents the grand adaptation mean adjusted for the level 2 predictors. As before, each level has its own error term.

HLM allows for several types of analyses. First, it provides estimates of the effect that each set of predictors has on the degree of adaptation, allowing us to test hypotheses 3 through 5. Tables 14 and 15 report these estimates. In addition, because HLM partitions the variance among the two levels, it allows one to calculate the relative amount of variance in total and for each level explained by the various sets of predictors. This is accomplished by comparing succeeding models and calculating the reduction in the magnitude of the variance components for each level (Zickar & Slaughter, 1999), in this case the variance components of the within- and between-unit intercepts. This is

---

26 The Level 1 Distance slope is significant in the Deviation model while the Level 2 Distance slope is significant in the Non-Standard Products model.
analogous to the use of R-squared in linear regression (Snijders & Bosker, 1999). R-squared values cannot be used directly in HLM, however, because there are several variance components involved (Snijders & Bosker, 1999). This analysis allows us to describe the relative effect of various sets of predictors.

4.4.6. Results

Table 13 reports the potential range, actual range, and standard deviation of the independent variables. The mean is not included in order to preserve confidentiality. However, of importance here is not the mean but the overall range and variation for each variable.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Potential Range</th>
<th>Actual Range</th>
<th>Std Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region of U.S.</td>
<td>5 Regions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population</td>
<td>0 to infinity</td>
<td>2,226 to 333,620</td>
<td>15,446</td>
</tr>
<tr>
<td>Per Capita Income</td>
<td>0 to infinity</td>
<td>4,610 to 189,500</td>
<td>10,450</td>
</tr>
<tr>
<td>Ownership Multiple Units</td>
<td>1 to infinity</td>
<td>1 to 11</td>
<td>1.00</td>
</tr>
<tr>
<td>Avg. Dist. to next 4 Units</td>
<td>0 to infinity</td>
<td>0 to 533</td>
<td>86.49</td>
</tr>
<tr>
<td>Education</td>
<td>1 to 8</td>
<td>1 to 8</td>
<td>1.33</td>
</tr>
<tr>
<td>Prev. Exp. in Same Industry</td>
<td>0 to 1</td>
<td>0 to 1</td>
<td>.40</td>
</tr>
<tr>
<td>Prev. Mgmt. Exp.</td>
<td>0 to 1</td>
<td>0 to 1</td>
<td>.42</td>
</tr>
<tr>
<td>Prev. Business Ownership</td>
<td>0 to 1</td>
<td>0 to 1</td>
<td>.47</td>
</tr>
<tr>
<td>Prev. Franchise Ownership</td>
<td>0 to 1</td>
<td>0 to 1</td>
<td>.35</td>
</tr>
<tr>
<td>Prev. Ownership of Franchise in Similar Ind.</td>
<td>0 to 1</td>
<td>0 to 1</td>
<td>.14</td>
</tr>
<tr>
<td>Unit Size (Square Footage)</td>
<td>0 to infinity</td>
<td>732 to 17,881</td>
<td>724.07</td>
</tr>
<tr>
<td>Unit Location Type</td>
<td>0 to 1</td>
<td>0 to 1</td>
<td>.24</td>
</tr>
<tr>
<td>Membership in Area Units</td>
<td>89 Area Units</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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The range for most of the variables is wide with large standard deviations. For instance, concerning education all possible levels are observed with the first standard deviation covering almost 5 of the 8 potential levels. Population is similar with a wide range and a first standard deviation that covers nearly half that range, suggesting widespread dispersion rather than just significant outliers. The table indicates that, as theorized, there are widespread differences in the environments units operate in and the inputs available to them. Tables 14 and 15 below, one for each dependent variable, report the effect of these heterogeneous environments and inputs on unit adaptation, or variation in firm routines.

Table 14: Effect of Predictors on Deviation from Recommended Product Mix

<table>
<thead>
<tr>
<th>Model</th>
<th>Null</th>
<th>1 - Controls</th>
<th>2 - Environ.</th>
<th>3 - Org. Inputs</th>
<th>4 - Relational Inputs</th>
<th>5 - Human Inputs</th>
<th>6 - Tang. Inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Sig.***</td>
<td>Sig.***</td>
<td>Sig.***</td>
<td>Sig.***</td>
<td>Sig.***</td>
<td>Sig.***</td>
<td>Sig.***</td>
</tr>
<tr>
<td>Month</td>
<td>Sig.***</td>
<td>Sig.***</td>
<td>Sig.***</td>
<td>Sig.***</td>
<td>Sig.***</td>
<td>Sig.***</td>
<td>Sig.***</td>
</tr>
<tr>
<td>Age of Unit</td>
<td>.000062* (.00006)</td>
<td>.000059* (.00006)</td>
<td>.000045* (.00006)</td>
<td>.000043* (.00006)</td>
<td>.000045* (.00006)</td>
<td>.000047* (.00006)</td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>3.479*** (.020)</td>
<td>2.935*** (.107)</td>
<td>3.095*** (.109)</td>
<td>3.743*** (.374)</td>
<td>3.804*** (.380)</td>
<td>3.847*** (.382)</td>
<td>3.859*** (.382)</td>
</tr>
<tr>
<td>Environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population</td>
<td>.026 (.066)</td>
<td>.043 (.065)</td>
<td>.038 (.064)</td>
<td>.038 (.064)</td>
<td>.038 (.064)</td>
<td>.038 (.064)</td>
<td></td>
</tr>
<tr>
<td>PCI</td>
<td>-.091 (.062)</td>
<td>-.079 (.062)</td>
<td>-.080 (.062)</td>
<td>-.081 (.062)</td>
<td>-.082 (.062)</td>
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<td></td>
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<tr>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Distance</td>
<td>-4.7-e4 (.001)</td>
<td>-.001 (.001)</td>
<td>-.001 (.001)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 14 Continued

<table>
<thead>
<tr>
<th>Model</th>
<th>Null</th>
<th>1 - Controls</th>
<th>2 - Environ.</th>
<th>3 - Org. Inputs</th>
<th>4 - Relational Inputs</th>
<th>5 - Human Inputs</th>
<th>6 - Tang. Inputs</th>
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<td>Lv2 Between- Unit Environment</td>
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<td>Not Sig.</td>
<td>Not Sig.</td>
<td>Not Sig.</td>
<td>Not Sig.</td>
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<td></td>
</tr>
<tr>
<td>Population</td>
<td>.017 (0.019)</td>
<td>.011 (0.018)</td>
<td>.007 (0.018)</td>
<td>.003 (0.019)</td>
<td>.005 (0.019)</td>
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<tr>
<td>PCI</td>
<td>-.134*** (0.019)</td>
<td>-.095*** (0.020)</td>
<td>-.104*** (0.023)</td>
<td>-.106*** (0.023)</td>
<td>-.105*** (0.023)</td>
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</table>

Organizational Inputs

<table>
<thead>
<tr>
<th>Area</th>
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<th>Sig. **</th>
<th>Sig. **</th>
<th>Sig. **</th>
</tr>
</thead>
<tbody>
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<td>Relational Inputs</td>
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<td></td>
</tr>
<tr>
<td>Distance</td>
<td>-.024 (0.023)</td>
<td>-.026 (0.024)</td>
<td>-.026 (0.024)</td>
<td></td>
</tr>
<tr>
<td>Multiple Own</td>
<td>-.012 (0.018)</td>
<td>-.011 (0.019)</td>
<td>-.010 (0.019)</td>
<td></td>
</tr>
</tbody>
</table>

Human Inputs

| Education | -0.035* (0.017) | -0.033^ (0.017) |
| Work in Same Industry | -.005 (0.017) | -.005 (0.017) |
| Managerial Experience | .002 (0.017) | .003 (0.017) |
| Owned Business | -.027 (0.019) | -.026 (0.019) |
| Owned Franchise | 1.82-e4 (0.018) | -.001 (0.018) |
| Owned Similar Fran. | .003 (0.018) | .003 (0.018) |

Tangible Inputs

| Location | .038* (0.018) |
| Square Footage | -.003 (0.018) |
### Table 14 Continued

<table>
<thead>
<tr>
<th>Model</th>
<th>1 - Controls</th>
<th>2 - Environ.</th>
<th>3 - Org. Inputs</th>
<th>4 - Relational Inputs</th>
<th>5 - Human Inputs</th>
<th>6 - Tang. Inputs</th>
</tr>
</thead>
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<tr>
<td>Variance Components</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 1, εj</td>
<td>.224*** (.004)</td>
<td>.181*** (.003)</td>
<td>.150*** (.002)</td>
<td>.145*** (.002)</td>
<td>.144*** (.002)</td>
<td>.144*** (.002)</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lv1 Pop slope</td>
<td>.579*** (.176)</td>
<td>.578*** (.171)</td>
<td>.529*** (.160)</td>
<td>.521*** (.158)</td>
<td>.524*** (.159)</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lv1 PCI slope</td>
<td>.847*** (.085)</td>
<td>.828*** (.083)</td>
<td>.821*** (.083)</td>
<td>.823*** (.083)</td>
<td>.823*** (.083)</td>
<td></td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>Lv1 Distance slope</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 2, ψj</td>
<td>.186*** (.013)</td>
<td>.194*** (.013)</td>
<td>.168*** (.011)</td>
<td>.104*** (.010)</td>
<td>.103*** (.010)</td>
<td>.103*** (.010)</td>
</tr>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Area slope</td>
<td>.016*** (.005)</td>
<td>.016*** (.005)</td>
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<td>Region slope</td>
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N=57,215 for all models.  
Significant at *** p<0.001, ** p<0.01, * p<.05, & p<0.10: two-tailed tests.  
Standard errors in parentheses.  
Overall significance of constructs measured with the use of dummy variables tested using the type 3 test for fixed effects provided as part of the SAS Proc Mixed command.  
* Removed from model because no longer significant.

### Table 15: Effect of Predictors on % of Revenue from Non-Standard Products

<table>
<thead>
<tr>
<th>Model</th>
<th>1 - Controls</th>
<th>2 - Environ.</th>
<th>3 - Org. Inputs</th>
<th>4 - Relational Inputs</th>
<th>5 - Human Inputs</th>
<th>6 - Tang. Inputs</th>
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<tbody>
<tr>
<td>Controls</td>
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<tr>
<td>Year</td>
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<td>Month</td>
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<tr>
<td>Age of Unit</td>
<td>.00017*** (.00003)</td>
<td>.00016*** (.00003)</td>
<td>.000114* (.00003)</td>
<td>.000106* (.00003)</td>
<td>.000104* (.00003)</td>
<td>.000099* (.00003)</td>
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<td>Lv1 Within-Unit</td>
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<tr>
<td>Intercept</td>
<td>2.771*** (.040)</td>
<td>1.293*** (.218)</td>
<td>1.653*** (.218)</td>
<td>2.966*** (.783)</td>
<td>3.042*** (.1031)</td>
<td>3.150*** (.1048)</td>
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<td></td>
<td>3.130*** (.1057)</td>
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<tr>
<td>Environment</td>
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<tr>
<td>Population</td>
<td>-.061 (.074)</td>
<td>-.049 (.074)</td>
<td>-.049 (.075)</td>
<td>-.047 (.074)</td>
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<tr>
<td>PCI</td>
<td>.044 (.101)</td>
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Table 15 Continued

<table>
<thead>
<tr>
<th>Model</th>
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<td><strong>Lv2 Between- Unit</strong></td>
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<td>Region Sig.*** Not Sig. Not Sig. Not Sig. Not Sig.</td>
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<td>Population .052 (.039) .050 (.037) .045 (.037) .036 (.037) .042 (.037)</td>
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<td></td>
<td>PCI -.235*** (.037) -.161*** (.042) -.177*** (.046) -.180*** (.046) -.175*** (.046)</td>
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<td><strong>Organizational Inputs</strong></td>
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<td>Area Sig. * Sig. * Sig. * Sig. *</td>
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<td>Distance -.022 (.052) -.027 (.052) -.027 (.052)</td>
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<td>Multiple Own -.058 (.038) -.056 (.038) -.054 (.038)</td>
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<td><strong>Human Inputs</strong></td>
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<td>Education -.074* (.035) -.074* (.035)</td>
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<td>Work in Same Industry -.018 (.035) -.019 (.035)</td>
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<td>Managerial Experience .028 (.035) .031 (.035)</td>
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<td>Owned Business -.062 (.039) -.063 (.039)</td>
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<td>Owned Similar Fran. .025 (.037) .025 (.037)</td>
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<td><strong>Tangible Inputs</strong></td>
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<td>Location .060 (.037)</td>
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<td>Square Footage .020 (.037)</td>
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</table>

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Table 15 Continued

<table>
<thead>
<tr>
<th>Model</th>
<th>Null</th>
<th>1 - Controls</th>
<th>2 - Environ.</th>
<th>3 - Org. Inputs</th>
<th>4 - Relational Inputs</th>
<th>5 - Human Inputs</th>
<th>6 - Tang. Inputs</th>
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<tbody>
<tr>
<td>Variance Components</td>
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<tr>
<td>Level 1, ( \varepsilon_{ij} )</td>
<td>1.038*** (.020)</td>
<td>.927*** (.018)</td>
<td>.868*** (.018)</td>
<td>.836*** (.018)</td>
<td>.836*** (.018)</td>
<td>.836*** (.018)</td>
<td>.836*** (.018)</td>
</tr>
<tr>
<td>Lv1 Pop slope</td>
<td></td>
<td>.136*** (.084)</td>
<td>.142*** (.085)</td>
<td>.145*** (.086)</td>
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<td>.145*** (.086)</td>
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<td>Lv1 PCI slope</td>
<td></td>
<td>1.148*** (.199)</td>
<td>1.159*** (.199)</td>
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<td>1.145*** (.198)</td>
<td>1.144*** (.198)</td>
<td>1.144*** (.198)</td>
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<td>Level 2, ( \psi_{ij} )</td>
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<td>.743*** (.053)</td>
<td>.624*** (.046)</td>
<td>.339*** (.043)</td>
<td>.278*** (.045)</td>
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<td>.121*** (.026)</td>
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<td>Lv2 Dist. slope</td>
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<td>.069* (.033)</td>
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<td>75410.5</td>
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<td>74826.2</td>
<td>74832.2</td>
<td>74547.5</td>
<td>74554.1</td>
</tr>
</tbody>
</table>

N=57,215 for all models.
Significant at *** \( p<0.001 \), ** \( p<0.01 \), * \( p<0.05 \), ^ \( p<0.10 \): two-tailed tests.
Standard errors in parentheses.
Overall significance of constructs measured with the use of dummy variables tested using the type 3 test for fixed effects provided as part of the SAS Proc Mixed command.
^ Removed from model because no longer significant.

The final, fully specified model, model 6, is used to determine the effect of each predictor on adaptation. Hypothesis 3 posited a relationship between the differences in environments and adaptation. There is support for hypothesis 3 from both dependent variables. For both, increases in Per Capita Income decrease the level of adaptation, indicating differences in adaptation as Per Capita Income levels change. There was no evidence, however, that Culture, in the form of Region, affected adaptation levels.

Hypothesis 4 posited a relationship between tangible inputs, such as location and structures, and adaptation. For the Deviation dependent variable, there was evidence that
location matters. There was little support, however, for either hypotheses for Non-Standard Products or that unit size matters, for either dependent variable. This suggests that the Tangible inputs have some, albeit limited, bearing on adaptation.

Hypothesis 5 posited a relationship between intangible inputs and adaptation. Hypothesis 5a concerned human inputs. For both dependent variables Education is the only measure to have a significant impact. Increases in Education level decrease the degree of adaptation indicating that differences in education create variation in adaptation. However, for both dependent variables model fit decreases as non-significant variables utilize additional degrees of freedom. For Deviation the Level 2 variance component also does not decrease. It does for Non-Standard Products, however, suggesting that there is evidence of an impact of Human inputs for adaptation in the form of adding new routines only.

Hypothesis 5b concerned Organizational inputs. This variable had a significant effect on both forms of adaptation. There were significant differences between many different areas in terms of their effect on both dependent variables. Moreover, a type 3 fixed effects test, measuring the overall degree of impact for Area, indicates that there is a significant effect of Organizational inputs on the degree of both types of adaptation.

The last hypothesis, hypothesis 5c, concerned Relational inputs. There is support for this hypothesis for both dependent variables. In both cases the larger the distance, using the Level 1, time varying variable, the less the degree of adaptation. The obverse indicates that the closer units are the greater the degree of adaptation. This is exactly
what one would expect if the ability for knowledge to diffuse in a replicator system is dependent, at least in part, on geographic proximity. The degree of impact, however, is mitigated somewhat, by the decrease in model fit although this may be due to the inclusion of variables with no significant impact.

HLM models, as indicated previously, also allow us to measure the relative effect of each set of predictors. Table 16 reports, first, the amount of variance due to each level (and hence to inter-temporal and geographic variance), and second, the relative effect of each set of independent variables, including the controls, on the variance within each level for both dependent variables and on the total variance.
Table 16: Relative Effect of Predictors on Adaptation

<table>
<thead>
<tr>
<th>Deviation from Recommended Product Mix</th>
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<tr>
<td>----------</td>
</tr>
<tr>
<td>Wthn Unit</td>
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<tr>
<td>Btw. Unit</td>
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<td>Controls</td>
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<tr>
<td>Total</td>
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<table>
<thead>
<tr>
<th>% Revenue from Non-Standard Products</th>
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<tr>
<td>----------</td>
</tr>
<tr>
<td>Wthn Unit</td>
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<tr>
<td>Btw. Unit</td>
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<tr>
<td>Controls</td>
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<tr>
<td>Total</td>
</tr>
</tbody>
</table>

* Data not available for these variables

Part of the value of an HLM analysis is the ability to break down the amount of variation accounted for by level. Concerning variation in Deviation between units, the predictor accounting for the largest amount of variation is Organizational inputs followed by the Environment. These two account for nearly all of the dispersion around the recommended product mix accounted for in Deviation between-units. If we consider Non-Standard Products, however, while these two are still the largest sources of variation significant variation is also accounted for by Relational inputs. The difference between the dependent variables in the amount of variation accounted for by Relational inputs
suggests differences in how adaptation occurs if it the adaptation consists of reorganizing an existing model vs. adding to it.

While we anticipated the effect of the Environment, the fact that Organizational inputs is the largest single source of variation is surprising. What is also surprising is the lack of variation accounted for by Human and Tangible inputs. For Deviation between units these account for none of the variation and for less than 1% combined for Non-Standard Products. This suggests that, concerning variation between units, most of it occurs as a result of differences between Area franchisees in their policies concerning and support for their franchisees, including, perhaps, the degree to which they emphasize adherence to the recommended product mix. The rest is primarily due to differences between local environments.

Concerning variation over time within-units, both in terms of Deviation, or dispersion around the recommended product mix, and Non-Standard products, as one might expect, much of it is due to unit maturation, macro economic shocks, and the seasonal business cycle, i.e.; to the control variables. The second largest source of variation consists of changes in the unit environment over time with a small amount accounted for by Area franchisee support. What is surprising is that, concerning within-unit variation over time the control variables and the environment do not account for more of the variation. There is significant variation remaining to be explained leaving room for additional research to determine what may cause such variation. One potential
cause may be individual idiosyncratic decisions made by management which we are unable to measure in this study.

Concerning total variation in the degree of unit adaptation the set of predictors with the largest impact on adaptation are Intangible inputs. For Non-Standard Products, i.e.; adaptation through the addition of new routines, Intangible inputs account for more than twice the variance as the environment and three times as much as the control variables. For Deviation, i.e.; adaptation through reconfiguration of existing routines, they account for roughly 25% more than the environment and nearly half again more than the control variables.

The role of unit relations (distance between units and multiple ownership) and organizational membership as Intangible inputs is of particular interest. While unit relations represents the potential for knowledge spillovers, organizational membership may also play a similar role. Monthly franchisee meetings held at many of the area units may serve as diffusion points for ideas about reconfiguring the model and introducing new products. Unfortunately, it is not possible at present to tease out the effect of area units concerning spillovers vs. administrative support. In either case, both Organizational inputs and Relational inputs concern issues of placement of units within the overall network. Indeed, a significant majority of variation between units is due primarily to their placement within the larger network of units. This suggests a larger proportion of changes to the business model may occur in response to the adaptations of connected units than in response to changes in the environment.
The purpose of this chapter was to uncover the sources of unit level variation, or adaptation, whether intentional or not. Since, as we established in the preceding section, variation matters, the analysis has practical importance as it potentially suggests that franchisors may be able to control that variation. There are three potential classes of variation: 1) That which is uncontrollable. This type of variation will happen regardless; 2) That which is induced by the environment. This type of variation is controlled only by choosing unit location more carefully. Once a unit is placed it is too late to change without closing the unit (something which is difficult at best in a franchise environment); and 3) Variation which can be controlled through firm action, such as better franchisee screening mechanisms, tighter control of area franchise policies, increasing or decreasing communication between franchisees, tighter monitoring and training regimes, etc.

The theoretical literature that admits that variation is likely to occur intimates that it will solely be in response to environmental differences. The findings from this study validate that the environment is an important source of variation but not the most significant, neither are uncontrollable factors such as macro-economic shocks and the business cycle. Instead, the single largest source of variation is differential Intangible inputs. Variation induced by differential Intangible inputs is likely of the third variety suggesting that firms, indeed, may have at least the potential to possess capabilities in controlling the degree of variation within their firm. Given that variation matters, those that can control it best may gain competitive advantage.
4.5. Limitations

As with any study, there are limitations to this chapter. First, the study includes only a single firm. However, in this chapter we are not attempting to provide the complete picture of variation in replicator firms but rather, to provide a significant illustration and a counter-example to conventional wisdom. The state of the literature is such that a counter example may be useful in re-directing future research. Moreover, given that sufficient quantities of quality data at the unit level are notoriously difficult to obtain in these types of firms (Darr et al., 1995; Fenwick & Strombom, 1998) obtaining quality data from a significant number of units within a single firm likely outweighs the decrease in generalizability. This is also somewhat mitigated by the fact that the firm is roughly similar to other replicator firms in terms of operations and growth patterns, providing at least some measure of generalizability although that is not required. It should be noted, however, that the results may only apply to established, larger systems. Replication of the research results will be necessary to determine the extent to which the conclusions can be drawn from newer, smaller, systems. Needless to say, the conclusions should be applied to other systems with caution.

Second, there is always the possibility that significant variables have been unknowingly omitted from the analysis of heterogeneous environments and inputs. However, the independent variables included cover a wide spectrum of potential factors including those most widely recognized in the literature.
4.6. Strategic Implications

4.6.1. Variation from Replication

One implication of the analyses involving the sources of variation is that replication strategy itself may naturally lead to unit level variation. The very strategy that creates inertia at the center may lead to variation at the periphery. Specifically, replication, unless it is careful and limited, is likely to lead to unit level differences in environments and tangible and intangible inputs creating pressure to alter the standardized business model resulting in changes to fundamental routines.

Theoretically, if the firm is careful enough transfer could always occur in similar environments using homogenous inputs. As the firm grows, however, such opportunities will likely become scarce, necessitating alternatives. Indeed, the initial phases of replication strategy often entail fast growth as a means to capture market share and preempt competitors (Bradach, 1998; Winter & Szulanski, 2001), decreasing the likelihood of careful replication and increasing the likelihood of straying from the situation in which the original routines were developed. While it is possible that a portion of the situated set of routines may be generalizable to multiple environments and operational with a wide range of inputs it is also likely that, being situated in time and space, some portion is idiosyncratic.

Knott (2001) suggests that “drift” from the standardized model is likely to occur even when environments and inputs are similar. The operation of routines, even when incentives are aligned (Postrel & Rumelt, 1992), is often not automatic. “Drift,” in this
scenario, occurs not as an intentional response to environmental or input differences, but as an accumulation of small, unnoticed, differences and changes which, over time, lead to ever widening differences in unit direction. Increased replication only enhances both the possibility and consequences of routine "drift."

If firms cannot completely control the homogeneity of environments and inputs they are likely to establish monitoring and control policies in order to attempt to ensure the homogeneity of outputs (Nelson & Winter, 1982). However, fast growth, large numbers of unit, and the presence of franchisees operating across contractual boundaries decrease the likelihood of perfect control (Kaufmann & Eroglu, 1998; Sorenson & Sorensen, 2001), increasing the likelihood of local adaptation.

In nearly every case the measures used in the analysis of the effects of antecedents of adaptation have temporal precedence to the adaptation itself. For instance, the education and background of the franchisees is stable, pre-dating any adaptation. The region of the country, membership in an Area franchise, the location type and size of units are also stable, pre-dating any adaptation. The only variables which may not have temporal precedence are those that vary over time. Thus, at least to some extent, the data illustrate the process of replication inducing variation by 1) showing that units in the focal firm do indeed operate in different environments with different tangible and intangible inputs and 2) that these temporally precedent, differing environments and inputs have a sizeable effect on unit level adaptation.
4.6.2. The Effect of Variation on Competitive Advantage

Another potential implication is the possibility that competitive advantage in replicator firms may be affected by unit level variation. First, on the positive side, simulation research has suggested that traditional firms with the greatest degree of variation in routines are able to maintain a sustainable competitive advantage (March, 1991) and that this advantage increases as environmental turbulence increases (McGrath, 2001). Given that operation in diverse environments with heterogeneous inputs may lead to variation in routines in replicator organizations it follows that in times of environmental turbulence the greater the degree of diversity in operating circumstances the greater the competitive advantage.

On the other hand, in periods of relatively stable environments variation may have a significant negative effect on adaptation. While moderate levels of variation at the right times may have a positive effect on unit, and subsequently, firm performance, that effect appears to be relatively small while the negative effect of significant adaptation or any adaptation at the wrong times is significant. This suggests that during periods of relative environmental stability replicator firms with capabilities in capping variation are likely to possess a competitive advantage.

This suggests that competitive advantage may come directly from the general management of variation (Myong-Hun & Harrington Jr., 2000). Indeed, one of the central strategic factors in the long term success of replicator organizations may be the degree of control the center exerts. If the center is too lenient, allowing too much
variation, branding will suffer and the system as a whole will underperform allowing competitors to gain the advantage (Blair & Lafontaine, 2005). If too much control is exerted, insufficient variation may lead to system-wide inertia and subsequent firm death as the environment changes.

In addition, life cycle considerations may moderate the degree of desired control. Potentially the center should maintain tight control during the initial growth stages, while branding is weak and the need for central support is strongest. Later in the life cycle, the center may be able to effectively loosen its grip, profitably allowing variation to occur. For example, Kentucky Fried Chicken allows at least moderate variation to occur in units in older, saturated markets such as the United States, while it tightly controls variation in newly emerging markets such as China. In the United States, the majority of units are franchised with franchisees allowed to purchase a unit with minimal training. In China, only 5% of units are franchised, decreasing the variance associated with agency issues (Jensen & Meckling, 1976; Sorenson & Sorensen, 2001), and potential franchisees are required to work in an existing unit for a minimum of one year before buying a franchise, decreasing the variance associated with variation in human inputs.

Variation early in the life cycle may affect more than just branding. One result may be a decrease in the effectiveness of the template used for replication. Potential franchisees often visit multiple units in the due diligence process before deciding to join a franchise system. If new unit management is aware of multiple potential templates they are faced with a choice of what, exactly, they are going to implement in their unit. At the
very least this is likely to accelerate the degree of overall variation in the system as
different models are used as a template. In addition, it may lead to an increase in mixing
practices from existing templates which, as the first chapter in the dissertation suggests, is
tantamount to abandonment of a template and may lead to inferior transfers and
subsequent decreases in new unit performance and even an increase in new unit death
rates. This may suggest that, if possible, the center should limit the contact of potential
and new management to only those existing units that reflect the preferred template.

Competitive advantage may also arise from or be destroyed by superior routines
for managing specific sources of variation. For instance, in the focal firm organizational
inputs is the largest source of geographic variation. Specific routines for controlling this
type of variation, such as extensive training and monitoring of Area franchise support
routines may lead to competitive advantage. However, the continued application of such
routines in changing markets may inhibit the variation necessary for change.

4.6.3. Variation and Firm Evolution

Of course, variation alone does not provide a complete picture. Evolution occurs
through variation, selection, and retention. Concerning selection, there may be a number
of mechanisms. For instance, replicator organizations are likely to possess an internal
selection environment similar to that espoused by population ecology (Carroll & Hannan,
2000; Hannan & Freeman, 1989) for populations of firms. Specifically, as the
environment shifts the shape and direction of the overall firm may change based on the
death or removal of units which no longer fit the environment. Competitive advantage in
changing environments may be gained by an ability to surgically remove
underperforming or improperly adapted units or an ability to absorb the negative
implications of unit death more easily than competitors.

Second, the firm as a whole may be able to capitalize on the natural
experimentation inherent in widespread unit level variation. On the one hand, the center
may possess a metaroutine, or dynamic capability, in finding and capturing learning
generated by variation at the periphery and incorporating it in iterations of the
standardized model (Knott, 2001). On the other hand, dynamic capabilities in distributed
systems may not include the center involving the direct transfer of learning between
units.

Competitive advantage in this arena may be gained by either formal or informal
mechanisms for supporting knowledge transfer. Dynamic capabilities in replicator firms
may consist primarily of such mechanisms. The literature on dynamic capabilities
traditionally implies that such capabilities are held at the center of organizations. This
research suggests the possibility that dynamic capabilities may exist at the periphery
even, potentially, without the knowledge of the center. In addition, such capabilities may
not be conscious, existing as a result of previous policies allowing variation, and may be
triggered by external events such as a change in the selection environment.

The extent of variation possible in replicator firms may increase the possibility of
gaining competitive advantage through unit level learning. Specifically, as the firm
grows, system-wide variation is likely to occur. Within that variation, however, are
likely to be groups of firms operating in circumstances that are similar in at least some key aspects. The possibility of matched sets of circumstances may serve to increase the potential for competitive advantage from the transfer of knowledge (Knott, 2001). While variation increases the system-wide learning in general (Zollo & Winter, 2002), successful innovation at the periphery does not necessarily mean that the innovation is appropriate for the entire system. It may be specific to the circumstances at that location or only a subset of that circumstance such as having an educated owner/manager operating in a low per capita area. The natural experimentation inherent in expanding into varied circumstances may allow the firm to selectively exploit innovations on a small scale, matching them to unit circumstances, thus tapping into a broader base of innovations, increasing overall firm performance in response. Moreover, the original business model may not be the best model to use as a template in the process of replication. Rather, the most successful unit in a particular circumstance may be the most appropriate template. One determinant of long term competitive advantage may thus be firm capabilities, whether formal or informal, in discovering successful peripheral innovations, analyzing their determinants, and transferring them to appropriate locations that may be able to effectively implement them.

Changes in the shape and direction of the firm, whether they occur through an internal selection environment or through unit learning and knowledge transfer, may be similar to the construct of exploration in the exploration/exploitation literature (see March, 1991). Even if the change, as in the case of selection through the death and
removal of units, is unintentional it still occurs through variation which is associated with exploratory learning (McGrath, 2001). Sustainable competitive advantage in changing environments may thus be gained by the possession of robust routines for both exploitation and exploration, routines that may well exist simultaneously. Without successful exploitation routines (see Winter and Szulanski, 2001 for examples of such routines) firms either will not grow fast enough to gain a foothold in the market or will disintegrate as the transfer of knowledge from the center is either inefficient and costly or ineffective resulting in significant mutations and a disintegration of the commonality necessary for branding and effective central support. Without routines successful at harvesting the exploration inherent in variation (see Bradach, 1998 for examples of such routines) firms may fail to address environmental changes resulting in firm death or a slow demise as units leave the system.

Much of the current literature on organizational learning suggests that exploration and exploitation rarely occur simultaneously and that firms have difficulty switching between the two modes of operation (Crossan & Berdrow, 2003; Lee et al., 2003; March, 1991). This study, however, suggests that simultaneity is likely a common feature of at least franchise firms. Indeed, as Zollo and Winter (2002) hypothesize, the degree of exploration may be heightened by repeatedly “exploiting” a standardized model in unfamiliar environments (see Szulanski, 2000a for another example). Moreover, the key factors allowing simultaneity, the number of units in a firm and the degree of central control, are not franchise specific, suggesting that it would not be surprising to find
simultaneous exploration and exploitation in most large firms, especially multinationals operating across diverse environments with diverse sets of tangible and intangible inputs.

4.7. Conclusion

The purpose of this chapter was to elucidate the role of variation in replication strategy. Conventional wisdom and prior theoretical work on replication (Winter & Szulanski, 2001) suggest that firms engaging in replication are likely to be intensely focused on exploitation and thus bound by inertia, exhibiting low variation, a situation which tends to be self-reinforcing and damaging to abilities to change and hence long term firm survival (March, 1991). Using 11 years of monthly data for all units of a single, large replicator firm we present a counter example to conventional wisdom. We provide the first large scale empirical analysis showing that, as theories predicting variation due to fit with heterogeneous environments would suggest, not only does variation in fundamental routines exist in replicator firms but that it is persistent and wide spread. While the center, the headquarters unit, exhibits low variance consistent with exploitation, there is significant inter-temporal and geographic variance at the unit level.

A primary mechanism of firm evolution is through a process of variation, selection, and retention (Ginsberg & Baum, 1994). The data and analyses in this chapter provide the genesis of an explanation of replicator evolution by explicating the basis of variation in such firms. The counter-example suggests a need to rethink the conventional wisdom regarding the strategy of replication. While engaging primarily in exploitation such firms may have the capacity for large scale, simultaneous variation in fundamental
routines, a significant part of which variation appears to be caused by adhering to a
strategy of replication in the first place. This capacity may explain why, despite current
predictions in the literature, many replicator firms have survived for decades in industries
with very little churn in ordering of market share.

Not only did we confirm that extensive variation is possible, thus establishing the
possibility of replicator firm evolution, but also ascertained the extent to which variation,
or adaptation at the level of the individual unit, affects performance in the short to
medium term. Beyond the issue of firm evolution this answers the basic question of why
a replicator firm should care about the level of variation. This is the first large N
empirical analysis of this issue that we are aware of. While we first showed that
extensive variation is possible in replicator firms we also showed that such variation,
despite heterogeneity in environments, tends to decrease unit performance. The
relationship is curvilinear with moderate degrees of adaptation generally positive, but
only during the median years of a unit’s life. Early or late adaptation carries significant
penalties.

If, as we established, adaptation matters, a final question of interest is the sources
of that adaptation. Such an analysis may provide an understanding of the levers
replicator firms may use in controlling the level of variation. To this end we undertook
an analysis of the antecedents of adaptation determining that heterogeneous intangible
inputs, especially in the form of organizational support from intermediate units like Area
franchises, and heterogeneous environments have the largest impact on the degree of unit level adaptation.

Previous work on replication has suggested that all key strategic decisions are made prior to the widespread replication of the business model. The three questions addressed in this chapter suggest that replication strategy should involve not just the process of obtaining a superior, stable business model, but the management of a large, variegated network as well. Indeed, while clearly having a better business model than one's competition may convey competitive advantage, the superior management of variation may increase firm profitability and potentially even lead to a better basic business model conveying, over the long term, significant competitive advantage to those firms who possess capabilities in such management.

Finally, while the chapter addresses only replicator organizations the basic conclusions may be generalizable to other types of firms, suggesting that change in many types of firms may be a function of alterations to fundamental routines in response to unit level differences. Indeed, the setting is unique in that, while focusing specifically on replicator firms, it isolates a phenomenon applicable to a wider range of organizations suggesting the findings may have implications for the nature of variation and change in many other types of firms as well. Indeed, conventional wisdom suggests that replicator firms may have lower variation than traditional firms suggesting that any effect of variation may even be heightened in other types of firms. Given that replication is the primary strategy for a large segment of firms, is a factor in the growth of many other
firms, from all types of industries, and that replication is one of the primary means of
exploiting knowledge assets in general, additional understanding seems increasingly
important.
5. Appendices

5.1. Appendix A

- Each sentence in the description of the scales below is the full text of the question as it appears in the questionnaire.
- Unless otherwise indicated, answers were scored using the default scale (Y! Y O N N!).
- Key for the default scale: Y!="Yes!"; Y="yes, but"; O="no opinion", N="no, not really", N!="No!"
- The overall score for each scale was computed by adding the standardized scores obtained from each question.

**Stickiness-Initiation** ($\alpha=.74$, Items=8) default scale unless indicated

Ranking the performance of <<company>>'s units on their results on <<practice>> was straightforward. Within <<company>> there existed consensus that <<source>> has obtained the best results with <<practice>>. Compared to external benchmarks, <<source>> has obtained best-in-class results with <<practice>>. <<source>> could easily explain how it obtained superior results with <<practice>>. <<source>> could easily point to the key components of <<practice>>. <<source>> was reluctant to share crucial knowledge and information relative to <<practice>>. Distributing responsibility for the transfer between <<source>> and <<recipient>> generated much conflict. The transfer of <<practice>> from <<source>> to <<recipient>> was amply justified.

**Stickiness-Implementation** ($\alpha=.83$, Items=13) default scale unless indicated

<<recipient>> recognized <<source>>'s expertise on <<practice>>. The transfer of <<practice>> from <<source>> to <<recipient>> disrupted <<source>> normal operations. <<recipient>> could not free personnel from regular operations so that it could be properly trained. Communication of transfer related information broke down within <<recipient>>. <<recipient>> was able to recognize inadequacies in <<source>>’s offerings. <<recipient>> knew what questions to ask <<source>>. <<recipient>> knew how to recognize its requirements for <<practice>>. <<recipient>> performed unnecessary modifications to the <<practice>>. <<recipient>> modified the <<practice>> in ways contrary to expert’s advice. <<source>> turned out to be less knowledgeable of the <<practice>> that it appeared before the transfer was decided. Much of what <<recipient>> should have done during the transfer was eventually completed by <<source>>. <<recipient>> understood <<recipient>>’s unique situation. All aspects of the transfer of <<practice>> from <<source>> to <<recipient>> were carefully planned.

**Stickiness-Ramp-up** ($\alpha=.77$, Items=9) default scale unless indicated

Initially <<recipient>> ‘spoon fed’ the <<practice>> with carefully selected personnel and raw material until it got up to speed. At first <<recipient>> measured performance more often than usual, sometimes reacting too briskly to transient declines in performance. Some people left <<recipient>> after having been trained for the new role in the <<practice>>, forcing <<recipient>> to hire hastily a replacement and train it ‘on the fly.’ Some people turned out to be poorly qualified to perform their new role in the <<practice>>, forcing <<recipient>> to hire hastily a replacement and train it ‘on the fly.’ The <<practice>> had unsatisfactory side effects which <<recipient>> had to correct. By altering the <<practice>>, <<recipient>> created further problems which had to be solved. <<recipient>>’s environment turned out to be different from that of <<source>> forcing <<recipient>> to make unforeseen changes to <<practice>>. Outside experts (from <<source>>, other units, or external consultants) could answer questions and solve problems about their specialty but did not have an overall perspective on the <<practice>>. Teams put
together to help \textless recipient\textgreater{} to get up to speed with the \textless practice\textgreater{}, disbanded because their members had to attend to other pressing tasks.

\textbf{Stickiness-Integration} (\(\alpha= .79\), Items=12) default scale unless indicated
\textless recipient\textgreater{} has not yet solved all problems caused by the introduction of the \textless practice\textgreater{}, because energy and resources were siphoned off by daily work pressures. Some of the ‘temporary workarounds’ devised to help \textless recipient\textgreater{} get up to speed became habitual. For the \textless practice\textgreater{} today, the roles are well defined. \textless recipient\textgreater{} personnel are content to play their roles in \textless practice\textgreater{}. The appropriateness of performing the \textless practice\textgreater{} in \textless recipient\textgreater{} has been explicitly questioned after its introduction. \textless recipient\textgreater{} has reconsidered its decision to adopt the \textless practice\textgreater{}, \textless recipient\textgreater{}’s expectations created during the introduction of the \textless practice\textgreater{} have been met. Individual values favor performing the \textless practice\textgreater{}. It is clear why \textless recipient\textgreater{} needs the \textless practice\textgreater{}. The justification for performing the \textless practice\textgreater{} at \textless recipient\textgreater{} makes sense. The activities accompanying the \textless practice\textgreater{} are: (circle one option) 1. OBVIOUSLY FUNCTIONAL, 2. SOMETHAT AGAINST THE GRAIN OF EXISTING WORK PRACTICES, 3. ARBITRARY WITHOUT A BASIS IN REALITY.

\textbf{Knowledge Proveness} (\(\alpha= .67\), Items=3) default scale unless indicated
We had solid proof that \textless practice\textgreater{} was really helpful; \textless practice\textgreater{} contributes significantly to the competitive advantage of \textless company\textgreater{}; For the success of \textless company\textgreater{}, the \textless practice\textgreater{} is: 1. CRITICAL 2. VERY IMPORTANT 3. FAIRLY IMPORTANT 4. FAIRLY UNIMPORTANT 5. NOT IMPORTANT AT ALL.

\textbf{Causal Ambiguity} (\(\alpha= .86\), Items=8) default scale
The limits of the \textless practice\textgreater{} are fully specified; With the \textless practice\textgreater{}, we know why a given action results in a given outcome; When a problem surfaced with the \textless practice\textgreater{}, the precise reasons for failure could not be articulated even after the event; There is a precise list of the skills, resources and prerequisites necessary for successfully performing the \textless practice\textgreater{}; and It is well known how the components of that list interact to produce \textless practice\textgreater{}'s output. Operating procedures for the \textless practice\textgreater{} are available; Useful manuals for the \textless practice\textgreater{} are available; Existing work manuals and operating procedures describe precisely what people working in the \textless practice\textgreater{} actually do.

\textbf{Source Lacks Motivation} (\(\alpha= .93\), Items=13) binary scales
Source saw benefit in: measuring its own performance; understanding its own practices; sharing this understanding with other units; sharing the limits of this understanding with other units; assessing the feasibility of the transfer; communicating with \textless recipient\textgreater{}; planning the transfer; documenting \textless practice\textgreater{} for transfer; implementing \textless recipients' support systems; training \textless recipients' personnel; helping \textless recipient\textgreater{} troubleshoot; helping resolve \textless recipient\textgreater{}‘s unexpected problems; lending skilled personnel

\textbf{Recipient Lacks Motivation} (\(\alpha= .93\), Items=14) binary items
Recipient saw benefit in: measuring its own performance; comparing it with the performance of other units; understanding its own practices; absorbing \textless source's understanding; analyzing the feasibility of adopting \textless practice\textgreater{}; communicating its needs to \textless source\textgreater{}; planning the transfer; implementing the systems and facilities for \textless practice\textgreater{}; assigning personnel full time to the transfer; assigning personnel to be trained in \textless practice\textgreater{}; understanding the implications of the transfer; troubleshooting \textless practice\textgreater{}; insuring that its people knew their jobs; insuring that its people consented to keep doing their jobs.

\textbf{Recipient Lacks Absorptive Capacity} (\(\alpha= .83\), Items=9) default scale
Members of \textless recipient\textgreater{} have a common language to deal with the \textless practice\textgreater{}; \textless recipient\textgreater{} had a vision of what it was trying to achieve through the transfer; \textless recipient\textgreater{} had information on the state-of-the-art of the
practice»; «recipient» had a clear division of roles and responsibilities to implement the «practice»; «recipient» had the necessary skills to implement the «practice»; «recipient» had the technical competence to absorb the «practice»; «recipient» had the managerial competence to absorb the «practice»; It is well known who can best exploit new information about the «practice» within «recipient»; It is well known who can help solve problems associated with the «practice».

Recipient Lacks Retentive Capacity \((a = .81, \text{ Items}=6)\) default scale
«recipient» periodically retrains existing personnel on the «practice»; «recipient» has mechanisms to detect malfunctions of the «practice»; «recipient» regularly measures performance and corrects problems as soon as these happen; «recipient»’s personnel can predict how they will be rewarded for good performance in the «practice»; «recipient»’s personnel are provided with numerous opportunities to commit freely and publicly to perform their role; At «recipient» there is a clear focal point for the «practice».

Barren Organizational Context \((a = .77, \text{ Items}=14)\) default scale
Existing performance measures of the «practice» are detailed enough to be meaningful; Performance measures of the «practice» are taken frequently enough to be timely; Performance measures of the «practice» from different units are easily comparable; «company» enforces company-wide standard policies with respect to the «practice»; At «company» there is constant pressure to improve performance; It is easy to justify time spent visiting other units; To visit another unit, it is easy to justify travel expenses; At «company», improving performance by copying and adapting practices from other units is as legitimate as improving performance from own creativity, At «company», a unit that exposes those needs that it is unable to meet on its own loses status; At «company», a unit that exposes unresolved problems loses status; At «company», despite structural differences units can always learn from one another; Normally a best-in-class practice is most likely to be found outside «company»; At «company», managers seem to prefer to use external sources of help and support even though they are more expensive and less useful, At «company», corporate pride and values encourage managers not to look outside for help or to share with the outside

Arduous Relationship \((a = .71, \text{ Items}=3)\)
Communication between «source» and «recipient» is 1. VERY EASY 2. FAIRLY EASY 3. FAIRLY DEMANDING 4. VERY DEMANDING; Collaboration between «source» and «recipient» 1. IS SOUGHT ACTIVELY 2. IS WELL RECEIVED 3. PREFERABLY AVOIDED 4. ONLY IF NO OTHER CHOICE; Collaboration between «source» and «recipient» (same scale as previous question).

Reliability of the Source \((a = .65, \text{ Items}=8)\) default scale
«source» and «recipient» have similar Key Success Factors; «source» 1. INVENTED THE «PRACTICE» 2. WAS THE FIRST UNIT TO HAVE EXPERIENCE WITH THE «PRACTICE» IN «COMPANY» BUT THE «PRACTICE» ORIGINIATED OUTSIDE «COMPANY» 3. RECEIVED THE «PRACTICE» FROM ANOTHER UNIT OF «COMPANY»; «source» was able to accommodate the needs of «recipient» into «practice»; «source» had an hidden agenda for transferring «practice» to «recipient»; The superior results that «source» obtained with «practice» were visible to all units of «company»; The superior results that «source» obtained with «practice» remained stable over time; «source» possessed the necessary resources to support the transfer of «practice» to «recipient»; «source» has a history of successful transfers.
## 5.2. Appendix B

Table 17: Correlation between Knowledge Transfer Methods

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