PAPERS on Economics & Evolution

MAX-PLANCK-GESELLSCHAFT

0515

Replicating Organizational Knowledge:
Principles or Templates?

by

Charles Baden-Fuller
Sidney G. Winter

REPLICATING ORGANIZATIONAL KNOWLEDGE: PRINCIPLES OR TEMPLATES?

Charles Baden-Fuller

Cass Business School, City University

London EC1Y 8TZ

and

Visiting Fellow: Wharton School,

University of Pennsylvania

c.baden-fuller@city.ac.uk

AND

Sidney G. Winter

Wharton School, University of Pennsylvania

winter@wharton.upenn.edu

October 19, 2005

REPLICATING ORGANIZATIONAL KNOWLEDGE:
PRINCIPLES OR TEMPLATES?

ABSTRACT

We discuss how firms can replicate practices and knowledge embedded in practices by following principles, with no direct reference to an extant working example (template). Definitions are provided for the key concepts of templates, principles, and background knowledge. We address the challenges of providing operational measures for successful replication, and for comparing the efficacy of principles and templates. By using two longitudinal case studies of replication across the units of two multi-unit organizations, we support the central claim that in certain circumstances replication by principles can be as speedy and cost effective as replication with templates, and deliver results of comparable quality. The principle contingencies affecting the relative performance of the two methods are identified. We also point out that replication efforts can be a source or incubator, as well as an application area, for dynamic capabilities in an organization. We briefly suggest what the results may mean for theories of knowledge-based competition.

Key words:
Replication, Principles, Templates, Capability Development

REPLICATING ORGANIZATIONAL KNOWLEDGE:
PRINCIPLES OR TEMPLATES?

A key competence for organizations is the ability to turn small successes into big ones – in other words to "go to scale" or "exploit" (March, 1991). Firms can scale up in two ways: they can increase capacity by increasing the size of an individual productive unit and the dimensions of its equipment, which often involves aspects of learning or "scale-augmenting" technical change (Levin 1977; Spence 1981). Alternatively, and the subject of this paper, they can employ "replication" reproducing the practices of an organizational unit of a given type in a new location. Replication forms part of the broader field of knowledge-related aspects of competition (Winter and Szulanski, 2002). As a topic it is distinguished from the broader study of the transfer of practices or technologies by a characteristic focus on the "establishment" level – on productive units in specific geographic locales, like bank branches, coffee shops and factories. Such units embrace productive activity that is coherent and complex, where managing interfaces among complementary and interdependent processes is a significant challenge. Multiple practices, and often multiple technologies, are involved. They have to fit together. The challenge of making them fit is faced as an organizational design task at the establishment level.

Replication is a close cousin to imitation. Organizations frequently seek to imitate the success of others in the attempt to close gaps or share in the gains from an innovation. If processes can be copied successfully and cheaply, first mover advantages may be eroded (Teece, 1976). In replication, an organization is intentionally reproducing or diffusing the success *it has itself enjoyed* in some limited setting or locale. Because of its superior opportunities to probe the sources of the original success at the "template site," an organization attempting replication should be expected to have an easier time than an imitator "from afar" (Nelson and Winter, 1982, pp. 119-120).[1] The value of replication is therefore the ability to diffuse faster than rivals can either imitate or innovate. Now Rivkin (2001) has cogently argued that situations in which replication is very easy may be ones in which imitation is also easy, while those in which it is very hard may defy leveraging efforts entirely. Thus the "sweet spot" from the viewpoint of sustainable competitive advantage lies somewhere toward the middle of the continuum – as Rivkin says, at "moderate complexity."

Replication is fundamentally about knowledge transfer, and there is a long and honoured literature on the micro-processes of knowledge transfer that spans not just management but also other disciplines such as the history of science. Argote and Ingram (2000) provide an excellent summary of the state of management knowledge, emphasizing the complexity of the micro aspects of the transfer process and the critical importance of socialization.[2] They distinguish between transferring people, tools and tasks (a distinction that also takes account of technology) and note that our cumulative understanding from many empirical studies (too numerous to cite here) indicates that effective transfer of organizational knowledge is typically accomplished by

---

[1] The term "template" was first used in this particular sense by Nelson and Winter (1982: 119). This usage was derived from the prior extension of the word's meaning by molecular biologists. In contrast to common definitions of a template as a *guide or framework* that is something less than a complete functioning entity in its own right, the modified usage ascribes template status to such an entity (e.g., a DNA or RNA molecule, an organizational unit, or a document) when it is *viewed as an object for copying* (and thus serving as a guide or framework).

[2] We see further examples in the works of Bradach (1997) and Miner, et. al. (2001).

either moving people, or by creating networks among people in the relevant organisations. Going to another field, we see that Collins (1985) goes to considerable lengths to show that transferring knowledge is complex and describe how socialization plays an important role at the micro level of knowledge transfer. He elaborates on the role of concealed versus unrecognised tacit knowledge, and why socialization cannot be replaced by artificial intelligence or other non-social mechanisms (see Collins and Kusch, 1998). While we take these micro-level findings to be authoritative (and we return subsequently to some micro-level issues), our focus here is on the relatively neglected question of the overall strategy or approach of the replication effort (but see Szluanski, 2000; 2002; Szulanski and Jensen, forthcoming). This is the gap that we shall fill; our central task is to identify the macro-choices and explore the contingencies that determine which approach may be best.[3]

This paper seeks to clarify our understanding of the replication of organizational knowledge by introducing a distinction that has been little noticed. Our central thesis is that most organizations adopt some combination of two strategies or approaches, which we call "Principles" and "Templates." The guidance provided by "Principles" has the flavor "Let me explain *why* this works and the *reasons why* I do it this way and then try to make it work yourself – I will comment on any mistakes I see." The "Templates" approach is suggested by "Watch very carefully *how* I do this; then copy *what* I do and try hard to copy it exactly – but don't ask me *why*." The word *why* is clearly central to this distinction, being at the core of one approach while often considered a pitfall in the other. The implied attitude toward the details of "how" is correspondingly different, with the principles approach suggesting that they should be determined (learned or invented) by the recipient, and the templates view being that they are provided by the source – in fact, they may be the main thing the source has to offer. Although both approaches are typically at work in replication processes, the emphasis can lie strongly to the one side or the other. Focusing on the poles of the continuum is our analytical strategy for illuminating it.

Both approaches to replication can be supported by codification – by which we mean a "*how to*" manual recorded in the symbols of some appropriate, possibly technical, language. A manual that is appropriate to the principles approach seeks to impart understanding; it provides a sense of orientation with important sub-goals to be achieved on the way to full replication. A manual suited to the templates approach emphasizes the detailed steps and how to accomplish them. In practice, it seems that codification efforts generally lean rather strongly in the direction of the latter. A good illustration of this tendency is the approach of Xerox to the guidance of its photocopier repair technicians, as described by Orr (1998). Speaking of the instructions in the documentation provided by the company to the technicians, Orr says: "No rationale is offered; the explicit purpose of the tests and the interpretation of the results are known only to the designers of the documentation" (1998: 108). But this is not a logical necessity; in fact, an earlier version of the same documentation had gone much further in seeking to impart a sense of what core problem might lie behind the symptoms. It has also been proposed that the *creation* of

---

[3] Our emphasis on the macro level also distinguishes our approach from ones that strongly emphasize the participant discourse surrounding ways of doing things, what has been called the "ostensive aspect" of organizational routines (Latour and Woolgar, 1979; Feldman and Pentland, 2003). While the discourse is certainly important, and particularly so in relation to "principles," the management problems posed by replication cannot be penetrated by looking exclusively at the discourse.

a codified account can be a useful journey toward causal understanding for the creators (Cowan, David and Foray, 2000; Zollo and Winter, 2002).

A central source of difficulty in replication is the fact that most successful organizational processes build on tacit knowledge, which in turn is embedded in a specific context. Although some tacit knowledge may become articulate with sufficient effort, a codified account necessarily leaves out the most stubbornly tacit parts, and fails to capture the full relevance of much of the context. It also fails to address a range of work contingencies any one of which may be improbable but which, between them, are quite probable– *something* is likely to happen that the manual does not cover. (And, even if the manual did succeed in being exhaustive in coverage, it would likely be incomprehensible on account of its length and complexity.) Hence, it is rarely if ever the case that replication can be accomplished merely by supplying the manual to the recipient (Polanyi 1964; Nelson and Winter 1982; Collins, 1991).

Even with the best possible transfer efforts, much of the tacit knowledge has to be created anew at the recipient site (Kogut and Zander, 1992; Nelson and Winter, 1982) – and the question of how best to support that process is a key one, answered differently by the two approaches. The principles approach clarifies objectives and the reasoning that links achievable sub-goals to the intended outcome. The templates approach favors an attempt to reproduce as accurately as possible the *context* of the required learning, as well as providing detailed teaching and coaching by people from the source site who possess the tacit knowledge – and thus to re-create the specific actions underlying previous success.

In what follows, we further develop the contrast between the two approaches and seek to understand the circumstances in which each might be superior. The templates approach is understood, believed in and widely relied upon by managers in retailing and other sectors. These managers clearly believe that disciplined reliance on a template is important for high-fidelity replication at the establishment level. Some of the recent management literature has focused on probing the subtleties of such template-based replication processes (e.g. Winter and Szulanski, 2001), and argued their merits in a wider range of knowledge transfer contexts (Szulanski and Winter, 2002). Here, however, our primary here is on principles and on the contingencies that affect the relative merits of principles as against templates. In particular, we report two substantial case studies of organizations that successfully employed the principles approach.

After a digression into history, the paper starts by exploring what is meant by replication, templates, and principles. It then probes the challenging problem of how we can determine whether replication has actually occurred. This sets the stage for the two in-depth case studies, which illustrate how replication by principles works; we finally discuss the factors affecting its success in the cases and in general.

CLARIFYING REPLICATION BY PRINCIPLES:
EXAMPLES FROM ECONOMIC HISTORY

Past studies of the introduction of new work practices have suggested that the principles approach is fraught with difficulty (e.g. Adler, Goldoftas, and Levine, 1999), and that most organizations resort to using templates to illustrate to workers what needs to be done. To the

skeptic, this opening section is a short digression into the field of economic history to show that using *principles* to recreate an existing success has a long documented history.[4]

In his authoritative account of the *American System of Manufacturing* (a description of the origins of mass production systems*)*, Hounshell (1984) showed that in most cases it was very difficult to transfer the complex knowledge of mass production systems from one firm to another, even when they were working together and had access to templates. Yet paradoxically he noted instances where the knowledge was accessed and recreated without traditional transfer mechanisms. For example, he noted that Ford's moving production line was almost certainly "borrowed" from understanding the causal logics behind the flour milling and other production line based industries whose "principles" were documented in contemporary magazines.

But for us the Ford example is clearly surpassed by Hounshell's scholarly observations (1984: 46-50) concerning the Colt armory that produced the famous revolver. Colt's approach was remarkable in both its scale and scope. Hounshell points out that Colt did not gather directly the details of the mass production systems that had been developed to a fine art by the Federal armories at Harper's Ferry. Rather, inspired by their results, Colt set about designing a factory that used the *spirit* or *principles* of *mass-production* he had seen documented in contemporary accounts. Hounshell shows that despite having never inspected the Harper's Ferry factories, Colt achieved considerable success and his factory was considered a model for others to inspect. Essentially, Colt recreated the instrumental logic of the American System without the necessity of observing the template.

Yonekura (1994) discusses a similar episode from a much earlier context. He recounts how Oshima Takaato was able to create intricate and advanced kilns to make iron in Japan in 1854 based entirely on reading Dutch text books aimed at a non-technical audience. These texts sketched the "causal logic" or "principles" behind European iron-making. Takaato's achievements were considerable, as it is well known that iron-making technology contains much tacit knowledge and is extremely difficult to replicate (see for instance Lazaric, Mangolte, and Massue, 2003). Subsequent efforts by the Japanese government at importing other iron making technology by means of template-transfer often failed, revealing by contrast Takaato's unusual capacity to replicate technology by principles. Takaato's achievement was in part due to his high level of background-knowledge; he was perhaps the foremost chemist in Japan at the time. The Colt and Takaato experiences suggest that complex knowledge can be replicated without templates when the principles are evident and the copyist has good background knowledge and strong motivation.

WHAT IS REPLICATION?

On the face of it, there does not seem to be much doubt that replication happens. The airport concourses and shopping malls of the great cities of the world provide ample (some would say *depressing*) testimony to the extent of replication activity in the arena of retailing and we know that it also occurs in other sectors. But the fact that the phenomenon is familiar belies the considerable challenge involved in defining it precisely. Indeed, the great philosopher Karl Popper warns us that defining replication requires judgment not absolutes.

---

[4] The following examples actually fall closer to imitation than to "replication" as we understand it here. However, there were templates available and access was not unduly restricted. The key actors chose to ignore the templates and take another path; that is the point we illustrate.

> *All the repetitions which we experience are <u>approximate repetitions</u>; and by saying that a repetition is approximate I mean that the repetition B of an event A is not identical with A, or indistinguishable from A, but only <u>more</u> or <u>less similar</u> to A. .... This remark may be added that for any finite group or set of things however variously they may be chosen, we can, with a little ingenuity, find always points of view such that all things belonging to that set are similar (or partially equal) if considered from one of these points of view; which means that anything can be said to be a 'repetition' of anything, if only we adopt the approximate point of view. This shows how naïve it is to look upon repetition as something ultimate or given.* (Popper, 1959: 420-422)

The significance of this point for science based on "replicable experiments" is confirmed by sociologists of science who have studied such processes closely (Collins 1985).

If we want to claim that the organizational unit at site B is a replica of the operations of the unit at site A (or perhaps the class of sites A1, A2, A3, etc.), what precisely is it that we have to check and compare between A and B? It seems clear that no highly demanding test, such as might invoke the words "exactly the same," can serve. First of all, as Popper's logic suggests, it is a foregone conclusion that such a test will shrink the set of examples to zero if it is applied stringently enough – B is not identical with A. Replication of practices and routines cannot occur in an absolutely strict sense since the people in the organization change (whether on account of time or space) and the environment surrounding the organization is never entirely constant.[5] Popper directs us to working from a "point of view" and for this paper that point of view is the knowledge-leveraging phenomenon. More precisely, we are concerned centrally with re-using knowledge of *ways of doing things*, i.e., it is essentially a matter of replication of organizational routines. Routines that respond effectively to differences in environmental circumstances will produce different observable manifestations in different environments, even when replicated precisely.

Let us explain this point with the example of a restaurant chain that wishes to leverage a well developed system that it has perfected in location A to another location- B. Obviously B will have different customers from A, and surely we do not want to conclude that replication is imperfect if the customers in B eat differently from those in A – at least, not if the system is equally capable of handling the different preferences of those at A and B. But what if the typical customer at B not only has different tastes, but spends much less than what the customers in A normally spend because they do not like the menu options? That is a harder call, and we propose that the replication will be declared unsuccessful if the specific replication effort itself turns out to be *ex post* a bad investment, or (if investment return is not the objective) is otherwise an *ex post* mistake. Efforts that fail to achieve positive financial results cannot be counted as successful replication – regardless of their success in some other perspective. The implication here is that organizational units that depend for their success on the reactions of local customers (like restaurants) face challenges in replication that are not faced by ones that depend on standardized outputs traded in global markets and that strictly control operational interactions with local environments (like semiconductor fabrication plants). In the latter case, defining

---

[5] See the valuable discussion of the "Heraclitus/ Ecclesiastes problem" and the "paradox of the n(ever) changing world" in Cohen, Birnholtz, and Hoch (2004).

successful replication from the user perspective is relatively easy (users find the outputs to be interchangeable is an obvious test); in the former more careful thought is required. This, we propose, is a correct and valuable conclusion.

Another dimension of the definitional problem involves the possibility that the apparent similarity between A and B is a false front of some sort; observable similarity on the surface hides consequential differences underneath. This situation can obviously arise by accident, as when strenuous efforts to replicate precisely are defeated by significant unforeseen obstacles and whose failure shows that replication has not been achieved (Knott, 2003). It can also arise, however, as a matter of more-or-less deliberate choice. The leveraging of productive knowledge is often complementary to the leveraging of reputation assets, and serious efforts at the latter may be accompanied by perfunctory efforts at the former. The phenomenon of the "faux replication" is well known and documented; it often arises in franchising when the franchisor is primarily seeking to profit from franchise fees and devotes minimal effort to assuring that the routines are copied, developed and embedded (Hunt and Nevin, 1974; Caves and Murphy, 1976; Winter and Szulanski, 2001).

Such a "false front" could be judged a significant and durable success in its environment if customers were numerous and highly satisfied. In an extreme case, we could imagine a "replica" that in fact operated, at a deep level, on quite different causal principles than its supposed original. Such a possibility seems realistic when, for example, the differences relate to human resource practices or organizational cultures. Perhaps the original is organized very hierarchically, and functions well because people follow the manual and obey direct orders without hesitation. Through accidents of locale or recruitment, the "replica" is staffed with individualistic problem-solvers who are occasionally insubordinate – yet it works just as well, perhaps better. The answer to "how does it work?" is fundamentally different in the two cases, so do we count this as successful replication? No, we propose to classify such a case as the accidental invention of an alternative process. Westney (1987) used similar tests when exploring the replication of societal forms between France and Japan, she looked behind the outcome to the processes and the intentions of the knowledge challenge to unpick the complexity.

Our conclusion on these puzzling questions is that both process and outcome must matter in a fruitful definition of success in replication. Replication is successful when broadly equivalent outcomes are realized by similar means. On the outcome side, a positive return on the specific investment in replication sets a bare-minimum standard for "equivalence." On the process side, it is the central causal principles governing the organizational performance that should be assessed in judging "similarity." On neither side should surface appearance control. These conclusions seem to be dictated by the combination of the observable reality of replication with the basic premise that "leveraging knowledge" is what the phenomenon is all about. Acceptance of this viewpoint does not, unfortunately, mean that there are easy answers to how it can be translated into operational terms in a specific case. In summary our position is:

Replication is about <u>leveraging knowledge </u>and is successful when "broadly equivalent" outcomes are realized by "similar means". In a specific context, the words "broadly equivalent" acquire relatively precise meanings that are dependent on the replication intent. Likewise the words "by similar means" have more precise meanings that depend on the knowledge that is being replicated.

It is perhaps reassuring to recognize that these needful digressions into conceptual issues are by no means unique to the business context of replication. We can learn much from the philosophers of science that have struggled with these questions. In psychology, according to Friedman, replication is paradoxical and difficult to define in absolute terms but none-the-less very clear in practice (Friedman, 1967: 149). In physics, Collins compares different kinds of replication including expert systems and comes to precisely the same conclusions (Collins, 1991: 58 and 76-68). In both these disciplines (as in the rest of the hard sciences) great store is set by the notion that objective knowledge is obtainable from replicable experiments. Experiments (and the consequential knowledge) are replicable when there is adequate control – i.e., when relevant factors are held constant across contexts, but identifying those relevant factors is the fundamental task. Moving from hard sciences to management research changes little (Tsang, 1999 and Singh, Ang, and Leong, 2003); we even see similar issues discussed in the history of art (Hockney 2001). So it is appropriate to recognize that in the business environment as in science, replication tests are matters of pragmatic truth, in which the understanding achieved in specific contexts carries a great deal of weight.

HOW TO REPLICATE

What are the components of knowledge embedded in organizational processes? How are these components constructed and how do they get replicated? All methods seem to involve three key components: templates, principles and background knowledge. Templates are working examples of the practices to be learned and principles are higher order causal understandings and rules. Background knowledge is what the recipient has to have to receive the knowledge.

Templates

A template is a working example of an organizational process in use, considered as repository of process knowledge. While much of the knowledge in the template may be captured in codified form, in schematics, blueprints or manuals, the codified versions generally fall far short of capturing "all the knowledge." The key point about a template is that, notwithstanding any deficiency of the manuals, all of the knowledge must be there – in the "*working* example." The problem therefore is to find where precisely the knowledge resides, and to capture it for further use. In this quest, it is important to recognize that part of the answer may lie in contextual factors not commonly thought of as being "knowledge" at all. Regardless of whether, for example, the air temperature is "knowledge," knowing that it contributes to the success of the template operation can be helpful when addressing the challenges of a new locale.

The use of templates typically requires the recipient to <u>repeatedly observe </u>the template in action. Repeated observation of the template in action is well known to assist in passing on craft skills. Obviously, a good pupil must do much more than observe, (s)he must practice. The efficacy of practice for learning can be enhanced by a good critique of the learner's efforts, provided by an accomplished "master" or coach. This approach to knowledge transfer – sometimes called "apprenticeship mode" – is a familiar feature of transfer efforts in business and elsewhere. Using templates often requires that the recipient organization borrows personnel from the donor to supervise the construction of the plant and oversee the start-up phases (see for instance Hounshell, 1984).

In some cases, the template is a historical datum, originally created for its value as a business unit without regard to the possibility of replication. But in most cases as the literature

on chain organizations shows, the template used for replication by an organization is its own deliberate construction, created precisely to model the practices and knowledge-in-use in that organization -- though being also an exemplar of knowledge in use elsewhere. Such templates are not trivial to construct. The organization typically spends much time and energy when it engages in template construction, template refinement and codification of practice. A good template is easy to copy and to some degree self-explanatory; in addition, much has been codified. A poor template does not facilitate replication effectively, though it may function well enough as a unit in its own right. This may happen for a variety of reasons: codification may be too limited; or some context dependencies and requirements for transferring tacit knowledge may remain unidentified. In sum: to use templates means that, one way or another an effective working example must exist, be observable and be actively used in the replication process.

Copying from templates may require many visits and many attempts because there may be a lack of appreciation of the importance of some of the detailed practices within the template. Collins (1991) explains why this is the case for the early optical lasers and LaTour and Woolgar (1979) explain why it occurs in developing areas of chemistry. However, not all processes are replicated through the use of templates: some efforts rely much more heavily on principles. An obvious place where principles work better occurs when each potential recipient context differs so much that templates fail to capture the relevant information in a cost effective manner. Westney (1987) notes that transferring policing practices between France and Japan in the Meiji period (1870s) could not be undertaken using templates as the cultures and language were quite different and the locations were far apart. Instead, they copied using a process akin to principles.

Principles

Because the conveying of knowledge by principles is central to the process of teaching in universities, defining principles for an academic audience hardly seems necessary; we use them all the time. But further explication may be helpful for the context of organizational routines.

Principles capture knowledge at a deeper level than templates; that is they indicate what factors can produce which anticipated effects, and an appreciation of why. This understanding can be broad and abstract; the implications for the detailed procedures may be few, vague, or non-existent; the prescriptions may reflect causal logic in the strict sense or just empirically grounded and widely acclaimed heuristics or mental models. Success in conveying principles often depends, therefore, on supplementing them with more concrete examples, models, hints and sketches. Such examples are not intended as detailed implementation instructions (such as would be their role if templates were used); rather, they are intended to explicate the principles. It is through the action of exploring the example or sketch (and reflecting on its meaning) that the user acquires the missing knowledge and develops the needed understanding. In the case of organizational processes, the new knowledge is a new set of routines but can include other kinds of knowledge. Armed with solid understanding of principles, the recipient organization can often find its own way to successful implementation. (This is also the premise of much academic instruction in the "principles" of this or that.) Of course, this freedom entails a risk that the implementation will be seriously deficient, as is well illustrated by what happened in many attempts to implement "quality management" principles (Zbaracki, 1998) and in the academic setting is too often revealed at examination time. Also, reliance on the principles of any particular routine in isolation risks the missing of the hazards and opportunities arising from interactions among the routines (see MacDuffie (1995), on the interactions of "teams" and "training" and "JIT" practices).

The tenuous connection of principles to implementation details brings with it an important strength: principles are robust, and potentially much more flexible than templates. Marsden (1969) points out that Greek and Roman armies used the *theorem of two mean proportionals* to build military machines of appropriate (large) scale on site, without reference to individual templates and that these principles were more robust and more useful than templates had been. Until the writing and circulation of these texts that outlined the principles for building machines, it was said that builders of military equipment could not "scale" artillery pieces without reference to expensive (and highly dangerous) experiments. Templates, it seems, were not adequate to the task because they intrinsically lacked the crucial scale-related flexibility.

If knowledge about routines is successfully conveyed without reliance on a template, it is likely that principles are being used. Both principles and templates require the recipients of the knowledge to have skill and understanding that is background knowledge.

Background knowledge

For an individual recipient of knowledge, background knowledge includes knowledge of the language and the artifacts of the trade. According to Polanyi (1964), this language is typically exemplified in sets of rules or recipes (codified knowledge) and a set of practices (ineffable knowledge). For example, a novice violin player cannot reproduce the sound of Menhuin; nor can a novice artist reproduce Velasquez, the novice has a poor understanding of the rules and does not possess the practices. However, apprentices are often sent to copy old masters; as a student, the famous artist J.W.M. Turner, executed imitations of the masters Claude, Watteau and van Dyck that fooled many subsequent expert observers (www.tate.org.uk).

At the organizational level, background knowledge is often labeled absorptive capacity (Cohen and Levinthal, 1990; Zahra and George, 2002). Argote and Ingram (2000) perceptively note that while this organizational knowledge may include knowledge of facts, social knowledge is a key component that can contribute to making replication easier within as opposed to between organizations. It seems obvious that skilled trades and professions also constitute a rich store of background knowledge that organizations can draw on. In such trades, sharing the same training gives rise to a commonality of understanding that extends well beyond the boundaries of the firm. For example, designing buildings is a practice that trained architects know and can reconstruct when an individual trained architect moves between organizations. But when the office boy moves, the professional background knowledge does not move. Note that the ability of an organization to access the background knowledge of particular trades and professions also depends on the existence of social arrangements that certify the possession of the particular knowledge along with a relatively unambiguous language for describing who knows what (Nelson and Winter, 1982: 85-88; Cacciatori and Jacobides, forthcoming).

Some processes appear to defy easy movement even within an organization (Collins, 1985; Lapre and Van Wassenove, 2001; Rivkin, 2001). This can happen for a variety of reasons, including high complexity or context dependence in the template, flawed codification efforts, lack of understanding of principles, or insufficient background knowledge. In the case of fast food outlets, retail shops or copy shops, where there are well developed templates, replication may be relatively easy. The required background knowledge may be limited in a technical sense and focused on past experience in running a small business, and the social knowledge may not run deep. However, in the case of replicating making a new silicon chip plant or operating a new styled hotel, the background knowledge may need to be very great. Users may have to be

experienced engineers or have a very good understanding of how to run a hotel; in such contexts imperfect understanding may be a serious obstacle to knowledge transfer (de Holan and Philips, 2004).

RESEARCH DESIGN AND METHODS

Thus far we have defined some terms and measures; we now explore what these mean in the context of the replication of practices in multi-unit organizations. As we have noted, most organizations replicate by using a combination of principles and templates; that is they copy a set of practices by observing them regularly and repeatedly and at the same time try to understand what is happening and practice on-going adjustment. Arguably this "make do" approach works very well, but it is not always disciplined. More seriously, a make-do approach can be shown to create imperfections and errors in the transcription process (Jensen, Szulanski, and Casaburi 2003). Multi-unit organizations have learned to approach the replication issue more cautiously. Because they aim to copy into a wide variety of contexts, they have more demanding criteria relating to similarity of purpose and details of practices. Many utilize templates rigorously and omit the emphasis on principles to obtain uniformity among units (Winter and Szulanski, 2001). But, as we show below, not all multi-unit organizations have the same propensity to use templates, some use principles.

We examine situations where the origin of the set of practices that is to be replicated lies outside the focal units (though within the broader organization), and the possibility of several combinations of replication process exists. First, if the external source has a similar profile to the organization and is accessible, the recipient can use the external source as a template and ask internal units to refer to this external source in the copying process. In such cases, the first internal unit to copy from the external source becomes an additional template for other internal units; and for this reason we label this process of replication *the template-template method*. The external source needs to have a very similar context to the organization so that the template can be copied effectively, as when for example, a fast-food chain replicates its knowledge to a master franchisee within the USA which subsequently uses the new master as a local template.

More commonly, the organization will borrow elements of the externally developed practices, and then develop an internal master template that is replicated across the units. The initial process of borrowing usually involves some development and adjustment to local conditions, typically by the application of principles and so we label this process of replication *the principles-template method*. The external source typically has a different context that requires translation before a new internal master can be created, a problem that faced McDonalds when it went to Russia, and had to make many important modifications to the US model in creating a new template to take account of the new local context.

The third way for the organization is to seek to identify the core elements of the practices used in the external source and develop a set of guiding principles (without developing a template or full scale working example) -- and then implement these elements in a new set of standardized practices that are executed *simultaneously everywhere*. It should be stressed that in this third approach, the practices in the original external source are not used as the template either – although skill development for particular tasks may draw on examples from that source or other. We label this method of replication *the principles-principles method*. In this case, the

external source provides inspiration and the internal challenge is to explicate the principles that are relevant to the new internal context, such as in the Colt example.

As this paper focuses on replication from principles rather than from templates, we consider below the second and third methods. Those are the cases where an organization is inspired by and so borrows from external practices and having extracted the *principles* that guide the construction of the external example either decides to perfect new internal practices appropriate for the organization in a *template* and then roll it out sequentially (*principles-template*) or, instead designs and develops a standard set of *principles* to be executed into practice simultaneously everywhere *(principles-principles).*

EXHIBIT ONE ABOUT HERE

Our approach is to explore these questions in the context of two case studies. We recognize that cases do not allow for much variation, so generalization is hazardous. Even so, so we will attempt to assess how the choice of principles or templates in our cases reflects those specific circumstances, and reflect more generally on the considerations that might tip replication efforts in one direction or the other.

We will explore these cases using *semi-grounded methods* (Isabella, 1990). Our approach takes into account the comments of Gephart (2004) and fits our methods to the data. Such a design is highly appropriate where one seeks to fill gaps in existing knowledge and identify new lines of inquiry. It allows the researcher to understand time lines and interaction effects.

Our empirical focus is on two large multi-site organizations within Europe: 'Oil' an (anonymous) oil company is the UK petrol distribution division of one of the world's largest and most profitable multinational firms and is near the top of the Fortune list. 'Novotel' (the Euorpean arm of the Novotel hotel chain) is a division of the French multinational Accor Group that has 150 plus hotels and is in its own right one of the largest hotel chains in the world, and has a history of profitability and innovation.

Both organizations pride themselves on obtaining "high standards of uniformity". For example, Oil's parent company employs extensive benchmarking. When a particular unit (e.g. a refinery) has been identified as having "best practice" others are encouraged to copy that best practice, and if they cannot match the performance, will often be required to adopt the practices by a template-based approach. Freedom to be different depends on results. The initial development of new practices and new technologies is typically home-grown, but often with reference to industry best practice.

In the Novotel hotel chain, the history of the hotel since its foundation has been the use of templates to control both in form (almost all hotel units are purpose built to a common style) and in its operations (via rigid adherence to a rule book). Novotel pioneered the use of templates for the whole European hotel industry; although the use of principles was not unknown in the firm.

The cases focus on two instances, one in each organization, where contrary to strong organizational traditions, knowledge about working practices was replicated using the principles-principles method.

13

We ask three questions that follow directly from our opening discussion. First, is the method of using principles effective in our multi-unit organizations that desired to replicate widely quasi-identical practices? Our test of effectiveness requires us to look from the perspective of leveraging knowledge and note if the outcomes are broadly equivalent and are realized by similar means. The criteria include the test of whether the replication is an *ex-post* good or bad investment and whether the replication is faux or real.

Our second question compares the use of principles with that of using templates. Here we compare along the dimensions of speed and costs the chosen path with what might have happened if the other path had been chosen. Until now, little work has been done looking at the speediness of replication processes, yet speed is clearly an important dimension of competition and competitive advantage and so an important dimension of the comparison. Because our chosen organizations have a long history of using templates, and because there is common knowledge about template usage, we can undertake this "counter-factual" by benchmarking our cases against the template standards.

Third, we extend the discussion to consider how the initial conditions internal and external to the organization influence this choice of principles versus templates. We note factors such as the nature of the knowledge to be replicated and the background conditions including the presence of dynamic capabilities of the recipient organization and whether the use of principles acts as an incubator for learning.

THE DATA

In both Oil and Novotel, the knowledge that was to be replicated related to new ways of delivering an existing set of services. There was no new major product offering and no new locations involved. These new processes were particular contextual variations of practices that are widespread in other organizations, in other words the *knowledge incorporated in the practices* could be said to be well understood. The new practices included flattened hierarchy, empowerment of front line workers, improving service quality using total quality management, use of new work rotations (flexible from the employer point of view), and multi-skilling of front line workers. However, the way in which these practices could be executed in the studied organizations had to be contextualized to achieve the maximum efficiency and effectiveness.

To illustrate the range of practices we take the example of tanker drivers in distribution of oil to retail locations. Traditionally, tanker-drivers only drove tankers and did so within traditional shift patterns. The changes required the drivers to become multi-skilled, so they no longer just drove tankers but also undertook some of the clerical scheduling processes. They were expected to undertake this new task at least as efficiently as the clerical staff.

The drivers were required to help load their tankers with fuel at the depots if the automated equipment did not work correctly. This illustrates another feature of multi-skilling, but it was used on a contingency basis. The drivers were not expected to be as efficient at loading as the traditional terminal operators, but they were expected to know and obey all safety rules. They were also required to change their approach to working from that of piece work to general employment status with empowerment; that is the drivers changed from being told (and paid) to undertake specific tasks to identifying the tasks that needed to be done and doing them without specific incentives. This new status involved them in working new shift timetables set

by the company that required them to change their home-life patterns and to accept different shift lengths.

There were additional changes requiring new skills. Drivers interfaced with retail customers when making deliveries. Traditionally, drivers did not communicate with the retailers about orders or service, which had been handled by a separate department. After the changes, the drivers interfaced with retailers and were expected to undertake some forms of marketing of the company to the retailers and identify whether levels of service were appropriate to the customer needs. All of these new work practices required the drivers to interface to varying degrees with other parts of the organization: central routing, marketing, and loading depot managers. Failure of the drivers to perform the new tasks to the requisite standard set off a whole train of events that could result in a dimension of performance being compromised.

Front line workers at Novotel were also subject to significant changes too numerous to easily document. For example, bar tenders and waiters were required to learn the skills of each other's work and to learn to cook basic dishes. During quiet times, those tending the bar (who could be a bar tender or waiter) were expected to be able to take orders for food and if necessary go to the kitchen, cook basic dishes and then serve them correctly. These new routines required those that traditionally worked in the kitchen to change their practices so that bar staff could find the requisite tools, access pre-prepared food and undertake cooking tasks safely.

The practices involved in the cases were and are familiar ones in a global sense. Many firms in many sectors have developed specific working methods that relate to multi-skilling and working more varied hours. However, neither of our two organizations had adopted these practices until this moment, for in the past each had utilized a templates approach that stressed conformity and rigidity. As we will explain below to adopt the changes, each firm wrote manuals, crafted training programs and gave instructions that identified how the practices were to be undertaken using the "principles" approach rather than constructing working exemplars of depots or hotel outlets. The stress in our two organizations was on why change was important and the objective of change. The latitude for local interpretation on the detail was considerable but not overly so. In Oil, the practices had to be worked out so that safety procedures were not compromised. Working with large quantities of highly flammable materials means that safety is paramount and accidents are considered unacceptable. Although Novotel hotels spanned many countries and many contexts, local variations had to remain within the necessary requirements of standardization and uniformity in matters such as equipment, booking systems, financial reporting systems, hygiene and other standard operating procedures.

The documenting process

Our research sought to capture how the organizations replicated knowledge, examining both the time dimension of the processes of knowledge transfer and subsequent changes. In each firm, interviews were carried out at multiple levels over a period of years focusing on both historical and contemporaneous events. As a research team we followed the commonly used procedures of Burgelman (1994) and Isabella (1990), who have built on the methods of Eisenhardt (1989). The interviews were semi-structured and aimed at surfacing important events, perceptions, and documenting actions. The vast majority of interviews were tape-recorded and transcribed in full permitting careful analysis.

Exhibit Two gives more details of the sample, with summary data on the relevant business units and how many people were interviewed by the team. More than 40 interviews

were conducted over a period of more than one year in each organization. The interviews covered many levels and locations: top-level managers (defined from the perspective of the parent), middle level managers (located in the business unit where the actions occurred) and front line managers and operatives. In making these hierarchical distinctions we follow the definitions set out Burgelman (1983) and Kanter (1984). It should be noted that in each case the majority of the interviews took place before the end of the replication programs, so we could undertake some real time observations, and control for some of the dangers of retrospective bias. In addition, in each case, our team had access to high quality records about the state of the organization before we arrived.

EXHIBIT TWO ABOUT HERE

Our work also involved watching operatives at work including drivers, bar tenders, cooks and other staff. The standardized nature of many of the new processes could be seen relatively easily. In the case of Oil, we also used the opinions of experts who had a deep and extensive procedural knowledge. Our work also included obtaining internal confidential records documenting change processes and the metrics used to check quality, productivity and costs. We also obtained records of a team of anthropologists that had undertaken an extensive internal analysis within Novotel and we obtained some of the personnel records from Oil.

Exhibit Three explains how our data are linked to answering our questions. For instance when trying to determine the quality of the replicated processes; we could observe a driver loading a tanker successfully and within the safety procedures. But this was only one metric. More important, we asked the company's managers about the quality of the work and we examined the safety records (that include documentation of hazardous events such as spillages). In determining speed, we took careful account of the time line in the historical analysis (that is summarized in the text below). In determining the costs, we looked at productivity records and internal management accounts in the case of Oil. In the case of Novotel, we saw the overall income statements, but had to rely on top-management's assertions regarding costs although we asked several managers independently at the units and at the headquarters to see if they had an agreed view. In the following passages we describe the Novotel experiences first because it is richer and more accessible.

EXHIBIT THREE ABOUT HERE

THE REPLICATION PROCESSES
Novotel
How did these organizations build and execute the principles-based replication processes? In Novotel, the first move took place at a management open forum when senior managers in Accor decided that a change program should be instigated having as its dual objectives the reduction of costs and the installation of new work practices to increase differentiation.

Six months after this open forum, two new co-presidents were appointed to lead the Novotel division: Philippe Brizon, former head of Accor's Ibis hotels, and Giles Pelisson from

Accord's New York restaurant chain. This new top management appointed their own team, almost all of whom came from within the Novotel group. The agenda was change and adoption of new work practices, and it was clear from the interviews that the top management team wanted to "replicate" the best in class practices from the "Formula One" division of the Accord Group. However top management believed that stating this openly might not be the best way to achieve the desired result, and they decided that the template for the change should not be specified. Moreover, there was a deliberate policy of not directly transferring knowledge from other divisions such as Formula One by means of transfer of personnel or by building templates or by borrowing templates. The decision not to have a template and not to import managers from other parts of the group was a little surprising as the Accor group had a long tradition of disseminating best practices by using templates and personnel transfer, as well as a "best in class" training department.

The top management set about recreating the logic of the Formula One approach from first principles. They started by trying to work out the causes of the failures of Novotel. The new co-presidents along with their new team concluded that Novotel had become too inward looking and had developed serious rigidities; more specifically the business lacked marketing knowledge, as well as operational and strategic flexibility. Managers pointed to the existence of technical systems as obstacles to change, singling out "The Bolts" (a 95 item check list for "quality management") as symbolically important in this context. This system appeared to militate against more flexible practices because it left no room for empowerment of the front line worker and had no system of feedback and learning. For example, employees were given scripted greetings to give to customers and scripted methods of behavior that did not allow contextual variations.

In addition, the Novotel organization faced managerial rigidities: it had become very hierarchical, with many levels inside and above each hotel. Exhibit Four lists some of the obstacles to adopting the new practices in Novotel.

EXHIBIT FOUR ABOUT HERE

The new top team believed that Novotel had to adopt more flexible working practices to meet the continuing challenges of the future and that it lacked a desired set of values to underpin these practices. Such values would also support and assist the employees to undertake search and learning activity; thus improving the position of the hotel within the framework set down by top management. This would establish an on-going capability of improvement ("dynamic capability" as defined by Teece, Pisano, and Shuen, 1997; Winter 2003). The chosen agenda of change and adoption of new work practices was given a great deal of attention at the level of 'principles' but the details of the change were not specified.

Unusually, the top management rejected the suggestion that they hire traditional management consultants. Rather they hired some academic anthropologists who undertook interviews and observation and wrote a careful report on what they found. (We used this report to cross check what the managers told us.) This meant that the organization had no obvious set of trainers to provide the details of the new work-practices.

In discussing the need to bring in new practices, senior managers were acutely aware of several paradoxes. Gerard Pelisson, the uncle of Giles Pelisson, was one of the two co-

presidents of the parent company Accor that had founded the Novotel hotel chain twenty-five years earlier on the principles of entrepreneurship (consistent with the pioneering use of templates). Many of those who were hired by these two people were still present and talked about the old ways. Interviews made it clear that some of the desired values relating to entrepreneurship had existed in the business in the past, and the memories were buried deep in the minds of some of the employees – but they were not widely distributed around the organization.

The process of designing and executing the new learning was based on real-time change using the cascade principle. This resulted in all head office processes being changed at once followed by almost all the units changing simultaneously. First, the two co-presidents of Novotel took away the top management team and worked out in great detail what changes had to be made at the top of the Novotel organization. The ensuing implementation process took several months. It resulted in very detailed plans on roles, tasks, skills and head-office processes. Next the top management team co-opted more than 200 of the general managers of the individual hotels. In a massive exercise, once again the plans and the macro operating manuals were revisited. This process, named 'Retour vers le Futur,' centered on designing the methods and thinking behind the detailed hotel operating procedures and included attempts to teach (sometimes in a visual rather than written or verbal form) the often tacit procedures that underlay the effective working. The scale and scope of this project should not be underestimated: almost all of the top five management levels were involved in multiple task forces crossing organization boundaries. The multiple interviews of the research team and other documents showed that these teams met many times and had demanding agenda.

Most of the work planning and executing the renewal process was done from inside Novotel. Only token reference was made to the Accor Group Headquarters' training center of the Accor group and there appeared to be an explicit rule against using Formula One even though the co-presidents were well aware of the vitality and flexible nature of the Formula One capabilities.

Some six months after the appointment of the new co-presidents, the general managers took the outline plans and started to implement them in their own hotels. Hotels in the Novotel chain are quite large, usually with more than a hundred operatives and hotel managers had a major exercise to repeat the earlier exercises once again inside their organizations.

It would be incorrect to suggest that all the hotels had equal fortune in implementing the change, or that the successful ones approached the challenge in exactly the same way. In the six hotels we studied in detail, they all adopted the principles approach. Moreover, each hotel had broadly similar sets of routines that they sought to change with similar approaches and objectives. In each hotel, management rewrote the rule books along with the operatives and defined the new routines to make the blueprints work. According to the operatives we spoke to, these rule books gave direction as to the intent (e.g. make the customer happy or avoid waste) but allowed considerable latitude of interpretation of how this might be done (especially in comparison to the old ways of the Bolts). The latitude was always constrained by the complexity of the systems of a 4 star hotel. This effort took months of hard work with multi-functional teams assigned to complex detailed tasks. The manuals were written and tacit processes unpacked and changed. These changes were then executed speedily and simultaneously everywhere.

The organization did not stop at this point. The top management realized that they had not only effected an organizational change but that they had instilled into the organization a set of processes of search and learning of a higher order. Top management therefore introduced a series of follow-on changes to cement the innovations and fine tune the processes. These dynamic learning procedures required teams of operatives and managers to meet across the organization, to ensure that the new routines and blueprints that had been developed across the group were made more similar and that principles were embedded into the heart of the organization. Obviously, this later stage had some features that are akin to the idea of templates, but the groups did not seem to be operating as such. Rather they seem to see themselves as fertilizers of 'best practice' to check on the existence of true rather than *faux* replication.

Interviews with front line managers (general managers of hotels and their deputies) and operatives (waiters, cooks, cleaners) underscored the significance of the changes and adherence to principles, and in many cases the research team was able to observe the new routines in practice. For example, there was a transformation of the routine of greeting guests across all six hotels from a template script to a principles perspective. Top management monitored the speed and progress of transformation, and in the interviews at six different hotels in three countries we were able to check those perceptions. Moreover, we checked with management and their records suggested that the sample was "representative".

According to the top management of Novotel, almost all other hotels followed the style of the 6 hotels we studied, introducing new working practices by using principles rather than by templates. These practices were executed to a demanding common standard across the Novotel units.

Oil Distribution

At 'Oil' the course of change was similar to that of Novotel. A new managing director (the MD) (senior to the business unit manager in charge of Oil) arrived and started the change process. Although the MD was really a very senior manager, he was unusually active in the front line. Local Oil management reported to him that efficiency gains could be achieved, but that the pace of change to new routines would be slow due to difficulties in managing the truck drivers and the need to negotiate with their unions. The MD was greatly influenced by his own experience in managing radical change, and by the achievements in another part of his division, lubricants. Although the lubricant's division had a much smaller bulk distribution business, it had made considerable gains in the recent past, and in his view "showed the way." He encouraged his local team to plan a more radical course of action. As in the Novotel case, the MD did not suggest transfer of personnel from the lubricants division nor direct teaching of methods by that division. Rather, it seems from the interviews we had, that he wanted the distribution division to replicate the processes by using the logic of the practices.

Both centrally and locally, Oil suffered from too many hierarchical levels amongst drivers and the maintenance departments. (See also Exhibit Four located earlier in the paper.) The established work-practices meant that the drivers did not participate in the routing decisions and that maintenance was also compartmentalized. The company relied on the union for its communication between lower and higher tiers, a situation seen as very unsatisfactory. The culture of the middle and front line managers was "reactive" rather than entrepreneurial: practices of higher order search and learning were absent.

Although the MD's was deeply influenced by observing many of the desired shared values and competencies which occurred in the lubricants division, he rejected the idea of formally importing these competencies, and encouraged a self developed plan. For example, there was no significant hiring into the division; facilitators for workshops were internally generated, and it was only in the area of industrial relations that others from elsewhere in the group were consulted.

The MD encouraged a cascade process of change. The top management of the distribution unit used intense cross-functional teams, successively involving more levels of management. They removed several layers and came up with changes that had to be made to practices and methods of working for the senior managerial group. They also identified and designed the scale and scope of the changes to working practices throughout the organization, including new communications systems and new ways of working.

The new practices were designed to be taught to the front line operatives by six middle level managers, aided by workshop facilitators. The nature of the teaching appears to have been along the lines of the principles approach, especially as there was no template for the workers to observe. The changes would halve the number of terminal staff and require quite radical changes in work practices in the terminals and among the drivers. Drivers would take on junior management tasks and become multi-skilled. Because the workforce was unionized in a very traditional way, the new ways of working also implied de-recognizing the union as an organization that had the right to bargain over work practices (although the union was still allowed to represent the workers over some other issues). Management successfully marketed this significant change to the rank and file.

Interviews with front line managers and a close study of the actions of 26 drivers over a period of a year confirmed that the new work practices were seen as a locally developed solution in the business unit and "owned" by them. The sense of local development and ownership was strong, even though it was quite obvious that the practices actually bore a close resemblance to those adopted in the lubricants division.

INTERPRETATION OF THE DATA

When interpreting the data, we assess the two detailed studies of replication by principles against the background of general understanding of replication by templates, in those organizations and elsewhere. Our studies relate to large complex organizations transferring systemic knowledge. The scale of these efforts was such that it was impossible to observe all the units in real time. In Novotel the team only visited six hotels across three countries, but we conducted extensive interviews with management about what was happening in the other units. In the Oil Distribution example, the team only visited three of the six depots in detail, but we met operatives from every unit, and had management records on each site individually analyzed. These limitations along with the usual caveats should temper the conclusions drawn below. The discussion section explores three issues: the effectiveness of replication by principles, the other contextual factors that may have influenced this effectiveness, and finally the role of dynamic capabilities in facilitating the change and the effect of the changes on learning. Exhibit Five summarizes our findings discussed in more detail below.

EXHIBIT FIVE ABOUT HERE

Our first research question requires us to examine if the use of principles was an effective method of replicating knowledge practices from the perspective of leveraging knowledge and to check the issue of *faux replication* as well as costs. It is clear in our cases that the senior managers involved *considered* that they were engaged in an effort to replicate previous success; at Novotel they looked to Formula One and at Oil to the sister lubricant division. Our data are consistent with those judgments, but do not go significantly further. What is more important and much better illuminated by the data is the commonality of purpose of the more junior managers to achieve common replicated processes across the recipient organizations. Our test of "leveraging knowledge" is therefore the test of the resulting level of success in achieving these objectives of effectiveness. In other words, we ask whether after the changes the flexible processes across the Novotel outlets (or the Oil depots) were pretty much the same. And were the changes fit for purpose, that is did they work? Our best test metrics for these questions relate to Oil, so we once again reverse the order of discussion of the cases consider that organization first.

In Oil, the new practices had to comply with the safety and other controls. The job description of the terminal manager stated: *"Ensure that all staff under his or her control are aware of and abide by all the relevant Company operating and control procedures and/or statutory requirements."*

Clearly, the proposed changes could have led to declining standards in distribution and rising costs. The new practices were to be implemented in contexts that differed in terms of location size, people involved, customer types and heritage. There was ample opportunity for failures. We therefore checked measures of outputs that matter to customers, management and employees. The evidence was that on all metrics of outputs "performance" was improved consistently across all six units. For customers, "on-time" deliveries were tightly monitored within Oil and represent the management's key quality targets. We checked these (internal) records that showed a continuous positive trend that had been established for some years and was consistent across all six units. Another management concern was safety, which also concerned the drivers (they were carrying highly inflammable cargoes and so their lives were at risk in any accident). Records of spillages, accidents per million *km* driven, accidents in terminals etc., all showed that safety at each location was not compromised. There were other measures relating to effectiveness that involved operational costs. In Oil, costs were tracked on a monthly basis for each unit. The adoption of the new practices resulted in a dramatic reduction in operating costs at all locations.

It was clear to us as well as to management that the changes were not superficial; there was no "faux replication." We asked if the practices were being executed uniformly across all the employees and whether they were welcomed. To do this, we conducted a careful set of in-depth individual and group interviews with 26 drivers, and with permission we rode in driver's cabs and saw them at work. We found that the drivers clearly performed the new tasks well, "felt more in control" and admitted that "things were better." This does not mean that all operators did exactly the same thing, or that they executed the new routines equally effectively. What is does mean is that all processes were clearly monitored to see if they conformed to the principles and where they did not there was a corrective mechanism.

We performed similar tests for Novotel. Quality, efficiency and effectiveness were key metrics for the senior managers of Novotel. Unfortunately, Novotel would not allow us free access to their detailed records claiming that they were "irrelevant" as even top management had

not used these detailed records to check what was happening. What was relevant was that the presidents constructed a "war room" at the HQ in Evry, France where the progress of each hotel in the chain was charted on the wall during the replication process on a weekly basis under simple headings interpreting the detailed records. The progress was summarized by stars. The high visibility meant that everyone who entered the room could see whether hotels were performing well against the key criteria of "customer service" "flexibility" "efficiency" and "standards." All the key executive meetings were held in this room to emphasize the vital importance of evaluating new practices in each hotel against centrally defined metrics.

To give an example of how their tests match those that we propose at the start of this paper, one of the co-presidents explained: *"Everyone has to have his/her area of autonomy... But autonomy does not mean anarchy or independence so there will be a core of the product that people cannot touch." Co-president, G. Pelisson.* This statement affirmed both independence and its limits: routines were not rigid across hotels, but flexible to adjust to circumstances that might change by reason of location, time of day, time of year, customer etc. (We observed many moments of autonomy, including methods of greeting staff and locally organized events that reflected local cultures involving changing décor and menus.) Management had tests that looked at the way people approached their tasks as well as the performance in the tasks. These did not just rely on the general manager of a particular hotel, for they had processes that brought operatives at different hotels together to talk about common problems. We also used our interviews to check on the manner in which people approached the tasks.

In conclusion, in both the Oil and Novotel cases, the replicated processes worked, producing precisely defined and checked "similar outcomes" by "similar means" across a "wide variety of contexts" in accordance with our definition. On this evidence, replicating by principles can successfully leverage the knowledge embedded in complex organizational routines across a wide variety of contexts.

Our second question involves requires an attempt to determine whether replication by principles in these cases might be "competitive" with the (counter-factual) alternative of using templates. There are two dimensions here – relative speed and relative costs. Regarding speed, slow replication may be disadvantageous and speedy replication may confer dynamic advantages, for competition is never static. Zander and Kogut (1995) argue that speed of transfer depends on the degree of codification. In our cases, impressive speed was achieved by implementing principles, with concurrent codification effort in a supporting role.

In Novotel, each organizational unit was large, often employing several hundred people; always much larger than a typical fast food outlet and more comparable to the larger branches of a bank. Yet in each case, replication was to a large degree completed in a period of two years or less. Most of the 150 European hotels adopted the new practices within two years. In the oil distribution there were six major depots and many small depots employing nearly 1,000 people in all. Change was still challenging as there were important safety rules to be observed within the new work practices. Here change took about six months.

The speed of the replication in Novotel was remarkable and clearly competitive with the use of templates. The hotel chain was masterful at the use of templates; it had been built on the principle of opening a new unit at the rate of one a month for ten years. To change nearly 200 units over to a new set of procedures by templates would have required constructing the template and then rolling it out. Obviously this is quicker than building new hotels. But each roll out

requires training individuals and then matching them to the template. To have done this is less than 2 years would have required the template to have been perfected in a matter of months and the replication to have proceeded at the rate of several units every week. While perhaps not impossible, this would certainly have been very challenging, given the size and complexity of the individual units. Szulanski (2000) provides a detailed account of the routinization of the conversion of banks acquired by Banc One to the Banc One systems. This example seems broadly comparable to Novotel in that neither case involved "green-field" replications, but far-reaching changes in work practices in established organizations of substantial size. Over about eight years, Banc One did 135 conversions using methods that were largely sequential rather than parallel, and that relied heavily on templates – a rate somewhat over one conversion per month.

For Oil Distribution, the whole process took less than a year from plans to execution. This was not much more time than required to create a single template. With only six recipient units involved, replication presented no great challenge to do everything at once. The speed achieved nevertheless seems impressive.

We are also concerned with the cost effectiveness of using principles versus templates. If principles are speedier than templates in leveraging knowledge, are they more expensive? While our evidence does not permit a direct comparison of replication by principles with the same task undertaken with templates we can note what happened to total costs in these organizations.

In Novotel costs fell by about 10% across the whole group after the replication exercise was complete and they continued to fall at a faster rate than historically. Now it is hard in so large a company to attribute costs exactly to programs, but it is indicative of an efficient process. In Oil Distribution, total costs fell by nearly 30% in eight months and flexibility was improved. Here there was a closer cause-effect link in efficiency; management in this case went to some trouble to isolate causes of the costs decline and they appear to be due almost totally to the new routines. Moreover costs continued in subsequent years to fall faster than in the past. This achievement was sufficiently notable and important to cause very positive comment by a member of the group's main board, who described the actions as "highly significant for the group as a whole." The managements of these organizations were plainly satisfied with cost performance achieved through replication by principles.

DISCUSSION

To the extent that the evidence supports a judgment, it certainly appears that our cases constitute two success stories for replication by principles. We would like to go beyond that conclusion to answer our third research question with a probing analysis of the reasons why it turned out that way, and a rigorous comparison of the observed successes with the levels achievable through the use of templates. That, of course, is the sort of analysis that a single pair of cases cannot adequately support. There is nevertheless something to be learned by reflecting on the cases in the light of the contrasting logics of the two replication methods. We can also draw on prior work on replication by templates, and on broader understanding of organizations and human behavior. On this basis, we offer some tentative judgments about the circumstances that may have favored success in our two cases, and what might be the considerations that would generally favor the one replication method or the other. As will become clear, the various

considerations we identify are causally intertwined in a complex way. We begin our discussion with an exploration of knowledge issues.

Nature of the Knowledge to be Replicated

Earlier we suggested that the efficacy of principles versus templates depended on the circumstances and constancy of the environment where the replication was to be executed. Here we explore how the nature of the knowledge that is to be replicated influences the choice of the replication method. Two significant propositions can be derived very easily by considering the contrasting logics of the two methods. The templates approach emphasizes transfer and use of the detailed "how" knowledge embedded in the template. Its power therefore depends on two key contingencies. First, power is enhanced when the details matter and they are idiosyncratic – not familiar elements of commonly encountered skill sets. It is enhanced, secondly, when these details and the routines incorporating them, are suited to the new context. Thus in operations such as fast food and copy services, the template approach may be favored when workers come from a low wage pool that has few skills and little background knowledge.

Where the opposite conditions hold, the templates approach is hampered and the use of principles will tend to be favored. The latter point can be cast in the affirmative way, as follows. Since "principles" emphasizes providing the causal frame for learning the details, it will work well when the details are already known or readily learned – for example, because the required actions are common as background knowledge, or features of common skill sets. In architecture for example, every building project varies enormously, but training emphasizes the recognition of common elements using principles. Where adaptation is forced because of the circumstances of the new context, search for new solutions may be better guided by the sub-goals structure conveyed by principles than by close scrutiny of detailed solutions that are not necessarily effective in the new setting. This presumes, of course, that the principles embody causal understanding that is reasonably accurate at least at the "macro" level; skepticism about that premise is one of the important grounds for favoring templates.

We note in passing that this simple analysis readily accounts for the prominence of Intel's Copy EXACTLY! as the quintessential example of template-based replication policy (McDonald 1998). The complexity and sensitivity of semiconductor device production, reflected in the time required to reach high yield rates, indicates the presence of an abundance of significant idiosyncratic detail and a lack of agreed understanding of causes. As for the context change, a semiconductor fabrication plant is above all a setting where the context of activity is engineered and rigorously controlled. Effective identity of context between source and recipient is therefore an available option to a degree virtually unknown in service organizations.

Our case studies present a contrast to Intel's fabrication plants. Although the flexible work practices in our two organizations were novel and challenging for individual workers, they were far from esoteric. Each of the work practices we describe could be said to be based on widely understood ideas, although the putting of these ideas into practice can often be very tricky, as shown by Lapre and Van Wassenove (2001). Especially in the early stages of implementation, in our cases it was possible to create reasonably effective new routines with modest investments in planning, job design and training. The situation is somewhat less clear with respect to the need to adapt to specific contexts. Although there were important differences across locations in each case these contexts do seem well understood because there were no "new locations."

Another consideration suggests that the case for replication by principles was strong in the examples we studied. Many of the jobs affected by these changes involved a new way of interacting with customers that demanded worker initiative. Fixed scripted reactions were unlikely to be useful to the extent that individual customer or situational requirements are idiosyncratic. We all know the problem customers have with service workers who say "Can I help you" yet are clearly unable to do just that because of organizationally defined scripts.

Motivation

Certainly motivation is a key factor determining effectiveness in all production situations in which human beings are involved; a vast literature spanning several disciplines explores why motivation matters and how it can be influenced. The replication context is, in general, one in which the level of motivation of workers is likely to be particularly critical. Replication requires the creation of new routines – new at the least to the individuals performing them – and therefore demands learning at the individual level. Even when strong templates are available and the replication context appears highly similar, some positive level of adaptation is inevitably required due to idiosyncrasies either in the context or in the particular inputs, human and otherwise, assembled for the task (von Hippel and Tyre, 1995). Hence, there is a requirement not only for learning of old problem solutions, but for the creation of (at least) marginally new solutions. Such circumstances present significant challenges to workers, well beyond those of operation under established routines. In our Oil case, for example, drivers were challenged to acquire and execute new skills involving relationships with customers and participation in scheduling and fuel loading, and also accepted higher levels of personal responsibility. When replication is by principles, the logic of the approach says that a larger fraction of the implementation burden is carried by the learning and problem-solving capacities of the workers – the details of the required performances are not being supplied to them. Hence it seems reasonable to conclude that motivation is likely to be a more critical factor when replication is by principles than when templates are used.

It is also arguable that worker motivation enters the picture in another crucial way. Our organizations were high value creating service organizations where pleased customers are probably the result, above all, of efforts by workers who are trying to satisfy them. If so, the worker's involvement in the details of job design may have collateral benefits, even if the "best practice" details are sometimes missed as a result.[6] In any case, it appears that individual motivation and background knowledge, plus some training, did compensate adequately for whatever deficiencies the principles approach implied in terms of transfer of details.

Committed, Knowledgeable Leadership

The role of a clear direction provided from the top has long been noticed as an important feature of change processes and generation of new routines. For example, Eisenhardt and Brown (1999) study of product development processes argue that the role of a vision could be very powerful and even more effective than detailed routines in facilitating new product development. Stopford and Baden-Fuller (1994) in their study of mature European firms found that vision from the top of the organization was a vital feature that distinguished successful from less successful

---

[6] In his fine essay on Toyota's achievements at the NUMMI auto plant, Paul Adler observes that even highly uniform "Tayloristic" work practices can be legitimate in the workers' eyes, hence consistent with high dedication to the task, when the workers have had a role in designing those practices. (Adler, 1993; see also Adler and Borys, 1996).

rejuvenators. This is consistent with Senge (1990) who argued that clear direction and strong leadership provided the impetus for double-loop learning. Consideration of failed change initiatives underscores much the same point: lack of commitment and sustained focus at the top produces the phenomenon sometimes called "flavor of the month" or "here comes another one" syndrome (Juran 1989, p. 77). In each of our cases, a clear guiding vision of the future was provided by the top management, and management engagement continued through the "cascade" implementation process.

It is not always enough for top management to display commitment. It is often important also that people in the organization have reason to believe the claim that what is being proposed can actually be done and will have the intended effects. We see parallels here with the work of Garud and Nayyar (1994), who noted that many research-oriented firms had large stocks of dormant knowledge that had been kept "alive" and that a firm could access this knowledge and exploit it perhaps in new uses not originally conceived. Such dormant knowledge has a number of features that tend to reduce barriers to transfer. It typically has a known status (it worked well in the past) and was used in a context that was well understood (the organization's routines). In Oil, the exemplar was a smaller but successful unit of the same organization: lubricants. This division was very well known to the work force and managers; its successes had been much discussed in the company magazine. Similarly, in Novotel, the change initiative derived some credibility from the fact that it could be seen as a restoration of the flexibility the organization had displayed in the past and was currently embodied in the practices of *Formula One*, the adjacent successful division.

External and Internal Selection Environment

Like most situations involving organizational change, the replication context is shaped by considerations of resource availability on the one side and performance pressure on the other. Change generally requires resources; in replication there is in particular the need for some buffering against the deficiencies of performance that inevitably occur when new ways of doing things are being learned. Change also requires motivation, as just observed, and one common source of motivation is the perception that adverse consequences will ensue if performance is not improved. There can of course be other sources of motivation, and in fact replication is commonly thought of in terms of proactively leveraging success rather than fending off adversity. In our cases, however, we do find signs of the dialectic of slack and necessity, a dialectic tension long familiar in discussions of organizational innovation (Cyert and March, 1992; March, 1991;Calori, Baden-Fuller, and Hunt, 2000), but one not commonly reported in the replication context.

Both organizations faced external selection environments that were tough and getting tougher. In both cases, management's interest in flexible work practices derived in part from environmental pressures for cost-cutting and downsizing. For Oil, there was a retail price war in the UK, driven by large chain grocery-stores and hypermarkets (that are allowed to sell fuel). According to internal documentary evidence based on external market research and market bench-marking, these had taken a significant share of the market and utilized outsourced specialist contractors to deliver their fuel. They had lower costs partly on account of more efficient logistics due to larger volumes being sold at each site (allowing deliveries of whole truck-loads rather than partial loads). The high volumes may have been partly attributable to (alleged) selling of fuel at "cost" or "below cost" (allegations that other competitors made, but

that Oil refused to make in public). The pressure was on Oil to match these new entrants' costs, without having the benefits of better locations and cross selling opportunities.

For Novotel, the external environment was also very tough. There was a major down-turn in the traveling public following a war in the Gulf; this sent occupancy rates for all the industry downwards and turned many profitable hotel operations into loss making (source: industry trade association documents). The effects were sufficiently serious to seriously affect cash-flow of Novotel (source: audited financial reports of Accor). Added to these pressures, the hotel was facing increased competition at many of its key sites. A few years before, it had been the first to occupy many out-of town locations at motorway intersections and airports. Now many other hotels had entered these locations, especially major US based hotel chains used to operating on a large scale at low costs using standardized processes.

For small companies struggling to survive, such intense external pressure might eliminate the remaining room for constructive maneuver, enhancing rigidity or provoking desperate and dysfunctional cost-cutting efforts. That was emphatically not the case at our research sites. These were units of large, established companies with long records of success. Change efforts at both companies benefited from parent company support that afforded some protection from external pressures. Oil and Novotel managements were by no means free to ignore the external pressures, but the parent companies were willing to consider a wide variety of options. The top managements of our businesses were tasked by their parent boards with drawing-up plans to combat the external pressures, and were given in both cases board-level support for their actions (as Galunic and Eisenhardt, 1996 have documented in large banks). This board level support gave room for maneuver and allowed management to consider more options. According to our interviews, the preferred courses of action by the parent executives of Oil were either to use templates to roll out new practices or to close the division and outsource the whole of the operations to specialist contractors. The proposal to use principles, though ultimately adopted, was considered *risky*. Internal management countered the board and explained that they thought that using the principles approach would work and be swifter and cheaper. Similarly, in Novotel, some of the senior management team claimed that the principles approach was seen as risky, although we could not obtain any documentary or interview evidence from top management of Accor to independently corroborate this view.

It may well be that the context of performance pressure had something to do both with the choice of principles over templates and with the favorable results of that choice. At the top management level, it produced a demand for prompt action and a willingness to accept risks of failure.[7] Down through the organization, and at the working level in particular, acceptance of the burdens of substantial change may have been encouraged by the perception of a gathering threat to organizational viability, and hence to future employment prospects.

Dynamic capabilities and learning

It might be argued that success in using principles reflects the application of dynamic capabilities. But in both Oil and Novotel, there was a perception at the top management level that the pace of organizational learning had slowed and was inadequate to the environmental challenges. This strongly suggests that dynamic capabilities, defined as higher order routines that facilitate change (Winter, 2003; Zollo and Winter, 2002), were not a plausible explanation

---

[7] Hamel (1991), Bleeke and Ernst (1991) and Haspeslagh and Jemison (1991) all point to the difficulties of transferring organizational knowledge using principles.

for success with replication by principles. More detailed analysis confirmed this (see Figure Four presented earlier). Before the change, both organizations had many hierarchical levels and stifling routines such as the "95 Bolts" that blocked entrepreneurial working. It is not that quality oriented routines and hierarchy necessarily stop innovation; it was that the particular application of these routines and hierarchy in these organizations did so. The conjunction of too many unnecessary levels with many stifling routines served to block rather than facilitate learning.[8]

Our examples of successful use of principles in organizations that lacked dynamic capabilities or an established learning culture are broadly consistent with Winter (2003) who explains that organizations can often change on a one time basis under the direction of top managers. This capacity, he argues is not the same as dynamic capabilities. They also parallel the findings of Stopford and Baden-Fuller (1994) who suggest that change capacities should be categorized into three groups: those for catch-up, those for renewal (developing routines new to the sector) and leadership (those for staying ahead). They suggest that catch-up routines are the simplest to form. In our cases, the catch-up was not with immediate competitors but rather best practice in the global industry. The challenge of replication would therefore seem to fit the lower rungs of the rejuvenation ladder and so would explain why those rungs were relatively easy for the organizations to construct via the principles approach. Like Eisenhardt and Martin (2000) and Aragorn-Correa and Sharma (2003), we argue that some changes do not need dynamic capabilities; but they can prepare the ground for their creation.

In our cases, in fact, management hoped that the new practices would help build a positive learning culture as well as making a direct contribution to effectiveness. While the detailed question of the long-term trajectory of our two organizations is beyond the scope of this paper, there was evidence that the new culture of learning did take hold. As noted earlier, the enhanced pace of operational improvement extended for several years in both organizations, the length of time that we monitored results. Thus, replication by principles does not necessarily require the presence of pre-existing learning skills or dynamic capabilities; rather, experience with the successful use of principles can serve as an incubator for change and learning capabilities.

CONCLUSIONS

The paper set out to explain the different routes by which knowledge can be replicated, transferred or copied in multi-unit organizations where the resulting transfers have to achieve high levels of standardization. We explained that templates (the use of working exemplars and close copying) and principles (identifying causal structure and sub-goals) can be viewed as substitute processes (as well as complements, which, in some degree they generally are). We described replication efforts in two multi-unit organizations that shunned the templates approach, even though it was quite familiar to them and plausible templates were available within the respective parent organizations. They used principles instead; we found that this achieved impressive results, as measured by tests of quality, speed and costs. We then identified the

---

[8] Our example is apparently not unique in this respect; see Benner and Tushman (2002; 2003) for the general case that process management techniques promote rigidity because they tend to suppress all but the most incremental innovation. See also Benner (forthcoming).

contingencies that might favor principles over templates, according to the contrasting logics of the two methods, and found a reasonable correspondence between those contingencies and the actual contexts of our two examples of successful use of principles.
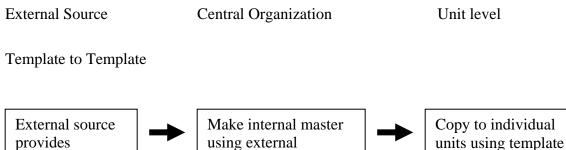
We believe that the distinction between principles and templates – and the associated contrast between why/ causal knowledge and how/detailed action knowledge – provides a useful perspective not only on replication but on knowledge issues generally. This we hold to be true, notwithstanding the fact that reality does not present us with completely pure examples on either side. Indeed, the power of the contrast may lie precisely in the fact that, like a pair of 3-D glasses, the sorting out of the mixed signal from reality yields the benefits of depth perception.

As we noted in the introduction, the strategic interest in replication is closely linked to the strategic concern with imitation. Considering the contingencies affecting principles vs. templates as replication approaches should provide some deeper insight into the nature of the "sweet spot" of "moderate complexity" characterized by Rivkin (2001). If the replicator's key advantage over the imitator is access to the template – as Nelson and Winter (1982) originally suggested – then the advantage may be weak where the templates approach to replication is itself weak relative to principles. Principles, as our historical examples illustrated, may often be visible and understandable from afar. This further suggests that, however, that imitation (by principles) may be a much more significant as a threat to an innovative "first mover" than it is to the firm that has emerged as the winner in an extended competitive contest. A rival can appropriate a big piece of the innovator's profit stream by getting the main story right, even if nothing approaching competitive symmetry is achieved. The position of the long-term winner, by contrast, is likely to derive from superior command of the details. Such command might be achieved on a standardized basis, via templates, or on a deeply adapted basis at each locale, resulting from extended learning within a framework set by principles. We leave further exploration of these interesting issues on the agenda for future work.
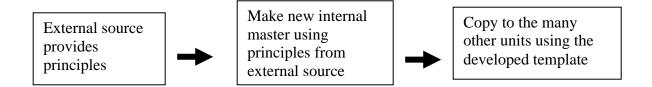
EXHIBIT ONE: REPLICATION METHODS COMPARED

External Source   Central Organization   Unit level

Template to Template

External source provides template	→	Make internal master using external template	→	Copy to individual units using template

Note: The external source needs to have a very similar context to the organization so that the template can be copied. Such events occur for example when McDonalds replicates its knowledge to a master franchisee within the USA
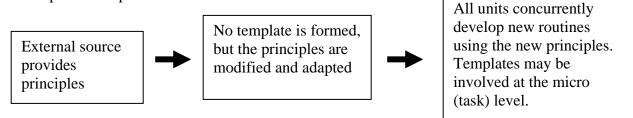
Principles-Template

External source provides principles	→	Make new internal master using principles from external source	→	Copy to the many other units using the developed template

Note: Here the external source typically has a different context that requires translation to create the new internal master. When McDonalds went to Russia, it had to create a new template based on the US model with many important modifications to take account of the very different local contexts.

Principles-Principles

External source provides principles	→	No template is formed, but the principles are modified and adapted	→	All units concurrently develop new routines using the new principles. Templates may be involved at the micro (task) level.

Note: The external source provides principles and the internal challenge is to explicate these principles in a manner that is relevant to the internal context. Example: Novotel replicating new working practices as described in this paper.

EXHIBIT TWO: DETAILS OF SAMPLE AND DATA COLLECTION

Parent Company	Oil Co.	Accor
Unit which changed	UK Distribution	Novotel (Europe)
Number of employees in the unit (approximate)	1,000 including 510 drivers and 180 depot staff	80,000
Number of persons interviewed from top management of group*	10	3
from middle management**	10	12
from operatives	25	40
Number of units	4 large depots 2 medium sized 11 satellites	More than 150 hotels across Europe
Interview coverage	4 large depots	6 hotels in 3 countries
Written documents coverage	Productivity Costs Quality metrics	Profitability Quality judgment Anthropologist report

Notes:

* Top management includes the CEO of the business unit where he is also represented at group level.

**The middle managers include front line managers. The numbers in the categories may not be precise because of difficulties of classification.

EXHIBIT THREE: METRICS FOR THE REPLICATION TESTS

Issue	The metrics	The data sources
Consistency in replication: outcomes and means	Observe the practices Look at quality and other performance records Ask expert advisors	*Observe the operators in work (Novotel and Oil)* *Examine the records of the businesses (Oil and Novotel)* *Use advisors from Industrial Engineering (Oil)*
Speed of using principles	Document the time line of the steps of the changes	*Interview those involved in the changes (both companies)* *Examine the documents of the company (Novotel had videos and Oil had written records)* *Cross check the company records with our own real time observations*
Costs of using principles	Examine the financial accounts Ask the executives	*Examine the internal accounting statements (Oil)* *Examine the internal costing records (Oil)* *Examine the audited financial accounts (Novotel)* *Interview the senior managers outside the divisions (both companies)*
Selection environments	External fitness environment Internal fitness environment	*Studied competitor analyses based on external bench-marking (Oil)* *Studied competitor analysis for European hotel industry (Novotel)* *Interviewed senior managers at the corporate centre (for Oil)* *Examined the annual reports and discussed the issues with the co-president Pelisson (Novotel)*
Dynamic capabilities and learning	Processes for change Top management behaviors	*Examine the track-record of change* *Examine organizational structures and processes* *Examine the behavior of top management evidenced through cross checked interviews and videos of events*

EXHIBIT FOUR: DYNAMIC CAPABILITIES AND OBSTACLES TO INITIATING CHANGE AT NOVOTEL AND OIL AT START OF THE REPLICATION PROCESS

	Oil Co UK Distribution	Accor: Novotel (Europe)
Rigidities of Technical Systems	Union rules and lack of knowledge preventing new ways of working	TQM and other technical systems
Rigidity of Managerial systems	Too many hierarchical levels and focus on wrong measures	Too many hierarchical levels and focus on wrong measures
Dynamic capabilities of improvement	Poor record of change- e.g. failed driver-ambassador initiative	Poor record of change – e.g. wide revulsion to TQM

EXHIBIT FIVE: TESTS OF REPLICATION

	Oil Co UK Distribution	Accor: Novotel (Europe)
Replicated Knowledge	Multi-skilling of existing work practices New ways of working: marketing, self-organizing and new use of IT	Multi-skilling of existing work practices New ways of working: marketing and self organizing and new use of IT
Original Location of Ideas	UK Lubricants division	Formula One Hotel division
Consistency of the Replicated Tasks Tests of Quality	Central records of units performance by task; Interviews with managers about the tasks; Observation of the task performance and worker recall	Interviews with managers about the tasks; Observation of the task performance and worker recall
Speed of the Replication	Rolled out new processes across 6 depots and 11 satellites in less than year	Rolled out new processes across 200 hotels in less than 2 years
Cost Effectiveness of Replication	Overall total costs fell by 30% in year one	Overall total costs fell by 10% in year one
Nature of External Selection Environment	Intense price competition from hypermarket and supermarket retailers	Major down-turn in demand due to Gulf war and arrival of new competition
Nature of Internal Selection	Top management was willing to resource change and allow for risky strategy	Top management was willing to resource change and allow for risky strategy

BIBLIOGRAPHY

Adler, P.

1993 "The Learning Bureaucracy: New United Motor Manufacturing, Inc." Research in Organizational Behavior, 15: 111-194.

Adler, P., and B. Borys

1996 "Two Types of Bureaucracy: Enabling and Coercive." Administrative Science Quarterly, 41: 61-89.

Adler, P., B. Goldoftas, and D.J. Levine

1999 "Flexibility versus Efficiency? A Case Study of Model Changeovers in the Toyota System." Organization Science, 10(1): 43-68.

Aragon-Correa, J. Alberto, and S. Sharma

2003 "A contingent resource-based view of proactive corporate environmental strategy." Academy of Management Review, 28(1): 71-88.

Argote, L., and P. Ingram

2000 "Knowledge Transfer: A Basis for Competitive Advantage." Organizational Behavior and Human Decision Processes, 82(1): 150-169.

Benner, M.J.

Forthcoming "Dynamic or Static Capabilities? Process Management and Organizational Adaptation to Technological Change." Strategic Management Journal.

Benner, M.J. and M.L. Tushman

2002 "Process Management and Technological Innovation: A Longitudinal Study of the Photography and Paint Industries." Administrative Science Quarterly, 47: 676-706.

2003 "Exploitation, Exploration and Project Management: The Productivity Dilemma Revisited." Academy of Management Review, 28: 238-256.

Bleeke, J., and D. Ernst

1991 "The Way to Win in Cross Border Alliances." Harvard Business Review, 69(2): 78-86.

Bradach, J.L.

1997 "Using the Plural Form in the Management of Restaurant Chains." Administrative Science Quarterly, 42(2): 276-303.

Burgelman, R.A.

1983 "A process model of internal corporate venturing in the diversified major firm." Administrative Science Quarterly, 28: 223-244.

1994 "Fading Memories: A Process Theory of Strategic Business Exit in Dynamic Environments." Administrative Science Quarterly, 39: 24-56.

Cacciatori, E., and M. Jacobides

Forthcoming "The Dynamic Limits of Specialization: Vertical Re-integration, Re-considered." Organization Studies.

Calori, R., C. Baden-Fuller, and B. Hunt

2000 "Novotel: Back to the Future." LRP, Long Range Planning, 33(6): 779-804.

Caves, R., and W.F. Murphy

1976 "Franchising: Firms, Markets and Intangible Assets." Southern Economic Journal, 42: 572-86.

Cohen, W., and D. Levinthal

1990 "Absorptive Capacity: New Perspectives on Learning and Innovation." Administrative Science Quarterly, 35: 128-152.

Cohen, M.D., J.P. Birnholtz, and S.V. Hoch

2004 "Organizational Character: On the Regeneration of Camp Poplar Grove." Unpublished Working Paper, University of Michigan.

Collins, H. M.

1985 Changing Order: Replication and Induction in Scientific Practice. Beverly Hills, CA & London: Sage. [2nd edition 1992, Chicago: University of Chicago Press]

1991 "The Meaning of Replication and Science of Economics." History of Political Economy, 23(1): 123-143.

Collins, H.M., and M. Kusch

1998 The Shape of Actions: What Humans and Machines Can Do. Cambridge, MA: MIT Press.

Cowan, R., P.A. David, and D. Foray

2000 "The explicit economics of knowledge codification and tacitness." Industrial & Corporate Change, 9(2): 211-54.

Cyert, R.M., and J.G. March

1992 A Behavioral Theory of the Firm (2nd ed). Oxford: Blackwell.

De Holan, P.M., and N. Phillips

2004 "Remembrance of things past: The dynamics of organizational forgetting." Management Science, 50(11): 1603-1613.

Eisenhardt, K.M.

1989 "Building Theories from Case Study Research." Academy of Management Review, 14: 488-511.

Eisenhardt, K.M., and S.L. Brown

1999 "Patching: Restitching product portfolios in dynamic markets." Harvard Business Review, 78(1): 91-101.

Eisenhardt, K.M., and J.A. Martin

2000 "Dynamic Capabilities: What are they?" Strategic Management Journal, 21: 1105-21.

Feldman, M.S., and B. Pentland

2003 "Reconceptualizing Organizational Routines as a Source of Flexibility and Change." Administrative Science Quarterly, 48(1): 94-118.

Friedman, N.

1967 The Social Nature of Psychological Research. NY: Basic Books.

Gephart, R.P.

2004 "From the Editors: Qualitative Research and the Academy of Management Journal." Academy of Management Journal, 47:454-462.

Galunic, C.D., and K.M. Eisenhardt

1996 "The evolution of intra-corporate domains: divisional charter losses in high-technology, multidivisional corporations." Organization Science, 7: 255.

Garud, R., and P.R. Nayyar

1994 "Transformative Capacity." Strategic Management Journal, 15(5): 365-387.

Hamel, G.

1991 "Learning in International Alliances." Strategic Management Journal, 12: 83-103.

Haspeslaugh, P.C., and D.B. Jemison

1991 Managing Acquisitions. New York: Free Press.

Hockey, D.

2001 Secret Knowledge: Rediscovering the lost techniques of old masters. London: Thames and Hudson.

Hounshell, D.A.

1984 From the American System to Mass Production: 1800-1932. Baltimore: Johns Hopkins University Press.

Hunt, S.D., and J.R. Nevin

1974 "Power in the channel of distribution: Sources and consequences." Journal of Marketing Research, 11: 186-193.

Isabella, L.

1990 "Evolving interpretations as change unfolds." Academy of Management Journal, 33: 7-41.

Jensen, R.J., G. Szulanski, and M. V. Casaburi

2003 "Templates and the Effectiveness of Knowledge Transfer." Unpublished Mimeo: Wharton School, University of Pennsylvania.

Juran, J.M.

1989 Juran on Leadership for Quality: An Executive Handbook. New York: Free Press.

Kanter, R.M.
1984 The Change Masters. London: Unwin.

Kogut, B., and U. Zander
1992 "Knowledge of the firm, combinative capabilities, and the replication of technology."
    Organizational Science, 3: 383-397.

Knott, A.M.
2003 "The Organizational Routines Factor Market Paradox." Strategic Management Journal, 24 (10):
    929-944.

Latour, B., and S. Woolgar
1979 Laboratory Life. London: Sage.

Lapre, M.A., and L.N. Van Wassenhove
2001 "Creating and Transferring Knowledge for Productivity Improvement in Factories."
    Management Science, 47(10): 1311-1325.

Lazaric, N., P-A. Mangolte, and M-L. Massue
2003 "Articulation and Codification of Collective Know-how in the Steel Industry: Evidence from
    Blast Furnace Control in France." Research Policy, 32: 1829-1847.

Levin, R.C.
1977 "Technical Change and Optimal Scale: Some Evidence and Implications," Southern
    Economic Journal, 2: 208-21.

MacDuffie, J.P.
1995 "Human Resource Bundles and Manufacturing Performance: Organizational Logic and
    Flexible Production Systems in the World Auto Industry," Industrial and Labor Relations
    Review, 48: 197-221.

March, J.
1991 "Exploration and Exploitation in Organizational Learning." Organizational Science, 2(1): 71–
    87.

Marsden, E.W.
1969 Greek and Roman Artillery. Oxford: Oxford University Press.

McDonald, C.
1998 "The Evolution of Intel's Copy EXACTLY! Policy." Intel Technology Journal, Q4: 1-6.

Miner, A.S., P. Bassoff, and C. Moorman
2001 "Organizational Improvisation and Learning: A field study." Administrative Science
    Quarterly, 46: 304-337.

Nelson, R.R. and S.G. Winter
1982 An Evolutionary Theory of Economic Change. Cambridge, MA: Harvard University Press.

Orr, J.

1998 "Images of Work." Science, Technology & Human Values, 23: 439-56.

Polanyi, M.

1964 Personal Knowledge. N.Y.: Harper and Row.

Popper, K.R.

1959 The Logic of Scientific Discovery. NY: Harper and Row.

Rivkin, J.W.

2001 "Reproducing Knowledge." Organizational Science, 12: 274-93.

Senge, P.

1990 The Fifth Discipline: The Art and Practice of Organizational Learning. New York: Double Day Century.

Singh, K., S.H. Ang, and S.M. Leong

2003 "Increasing Replication for Knowledge Accumulation in Strategy Research." Journal of Management, 29: 533-49.

Spence, A.M.

1981 "The leaning curve and competition." Bell Journal of Economics (now Rand Journal), 12(1): 49-70.

Stopford, J.M., and C. Baden-Fuller

1994 "Creating Corporate Entrepreneurship." Strategic Management Journal, 15(7): 521-536.

Szulanski, G.

1996 "Exploring Internal Stickiness: Impediments to the Transfer of Best Practice within the Firm." Strategic Management Journal, 17: 27-43.

2000 "Appropriability and the Challenge of Scope: Banc One Routinizes Replication." In G. Dosi, R.R. Nelson and S.G. Winter (eds), The Nature and Dynamics of Organizational Capabilities. Oxford: Oxford University Press.

2002 Sticky Knowledge. London: Sage.

Szulanski, G., and R. Jensen

Forthcoming "Presumptive Adaptation and the Effectiveness of Knowledge Transfer." Strategic Management Journal.

Szulanski, G., and S.G. Winter

2002 "Getting it Right the Second Time." Harvard Business Review, 80: 62-69.

Teece, D.J.

1976 The Multinational Corporation and the Resource Cost of International Technology Transfer. Cambridge, MA: Ballinger Utterback.

Teece, D.J., G. Pisano, and A Shuen

1997 "Dynamic Capabilities and Strategic Management." Strategic Management Journal, 18(7): 509-533.

Tsang, E.W. K.

1999 "Replication and Theory Development in Organizational Science: A Critical Realist Perspective." Academy of Management Review, 24(4) 759-781.

von Hippel, E., and M. Tyre

1995 "How Learning by Doing is Done." Research Policy, 24(1): 1-12.

Westney, E.

1987 Imitation and Innovation. Cambridge, MA: Harvard University Press.

Winter, S.G.

2003 "Understanding Dynamic Capabilities." Strategic Management Journal, 24(10): 991-996.

Winter, S.G., and G. Szulanski

2001 "Replication as Strategy." Organization Science, 12(6): 730-743.

2002 "Replication of Organizational Routines: Conceptualizing the Exploitation of Knowledge Assets." In C.W. Choo and N. Bontis (eds), The Strategic Management of Intellectual Capital and Organizational Knowledge: 207-221. Oxford: Oxford University Press.

Yonekura, S.

1994 The Japanese Iron and Steel Industry: 1850-1990. London: St Martins.

Zander U., and B. Kogut

1995 "Knowledge and the Speed of the Transfer and Imitation of Organization Capabilities: An empirical test." Organizational Science, 6(1): 76-92.

Zahra S.A., and G. George

2002 "Absorptive Capacity: A Review Reconceptualization, and Extension." Academy of Management Review, 27(2): 185.

Zbaracki, M.

1998 "The Rhetoric and Reality of Total Quality Management." Administrative Science Quarterly, 43: 602-636.

Zollo, M., and S.G. Winter

2002 "Deliberate Learning and the Evolution of Dynamic Capabilities." Organizational Science, 13(3): 339-351.