

**THE ROAD TO REPLICATION:  
A CASE STUDY OF HIGHWAYS AGENCIES IN ENGLAND AND THE NETHERLANDS**

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**ABSTRACT**

Replication is a process of leveraging knowledge to reproduce an organizational practice across a large number of units across time and space. We extend research on replication by examining the life cycle of activities involved in generating a practice in preparation for replication and transferring that practice across multiple outlets. Building on Winter & Szulanski's (2001) observation that replication is a process involving a life cycle of activities, we explore the dynamics of knowledge generation and transfer along two dimensions: (1) the exploration of new a principle and working example and exploitation of this standard practice across many simultaneous examples; and (2) the interaction between dynamic and operational capabilities as the practice is created, refined and standardized for large-scale deployment. The research setting is a case study of two large public sector highways agencies: the RWS in the Netherlands and Highways Agency in England. A conceptual framework is developed inductively based on our analysis and interpretation of the case study material. We demonstrate how the two organizations followed different roads to replication. Our replication lifecycle framework is useful for identifying problems that occur when an organization involved in transitioning from idea generation to replication tries to accelerate too quickly (little time for reflection), misses out a stage in the process, or moves too slowly.

**Keywords:** Replication, templates, routines, learning, management practices, and organizational capabilities.

## 1. Introduction

Large firms such as McDonalds, Barclays Bank, Tesco, the Body Shop, Starbucks and IKEA can achieve competitive advantages in national and international markets by replicating a successful practice. Replication strategy is defined as the repeated application of a successful organizational practice that can be used to achieve an organization's objectives (Szulanski, 1996; Winter & Szulanski, 2001; Szulanski & Jensen, 2004). Replication is applied to a wide range of practices including routines, best practices, production processes, products, services, templates, working examples, complex strategies and business models. In each case, replication refers to a process of creating and producing an exact replica of an original practice that can be reproduced in future and at one or more geographical locations.

Little is known, however, about how large organizations in regulated industries such as highways agencies, energy and water utilities develop, refine and replicate successful practices to achieve their strategic objectives. This paper examines the process of replication in the context of a regulated industry in two different national settings: the English Highway Agency (HA) and Dutch Rijkswaterstaat (RWS). It compares how these two public sector client organizations developed, prepared and rolled out new standardized contracts for re-use across decentralized units. The research adopted an inductive qualitative approach (Pratt, 2009) to examine the decisions, activities and events involved in the process of replication from initial idea through to pilot project to the adoption of a standardized format.

The literature on replication originated in efforts in the 1990s to understand the influence of imitation and knowledge transfer of best practices on competitive advantage (Rivkin, 2000). However, it was not until Winter & Szulanski (2001) seminal paper that we began to understand how the process of replication evolves through two stages of organizational learning: an exploratory phase when the an innovation (e.g. new technical formula, business model, product, process or service) is created and stabilized is followed by an exploitative phase when the innovation is leveraged for large-scale rollout. The growing body of research inspired by the two-stage model concentrates on the

transition to the second stage of exploitative learning when a successful practice is “frozen”, copied and diffused among a large population of units. Firms compete and grow in high volume standardized markets by exploiting an exact copy of the original successful template. Recent empirical research on IKEA has questioned this assumption, revealing that international firms are constantly revisiting, modifying and adjusting the original template to account for local specificities and changing market conditions (Jonsson & Foss, 2009). However, the literature pays little attention to the front-end exploratory stage of the two-stage model concerning how and when a practice is identified and prepared for replication. This paper aims to fill this gap by presenting a more fine-grained conceptual model to improve our understanding of four generic phases in the complete lifecycle of replication activities and provide clearer guidance to practitioners wrestling with the strategic challenge of how to achieve successful replication.

Over the past decade, the Dutch and English highways agencies have embarked on strategies to develop new contracts defining innovative ways of working with the private sector. In both cases, this involved identifying the organization’s strategic objectives and vision for an innovative form of public procurement; testing and experimenting with different forms of contract with private contractors in a number of pilot projects; selecting and refining the preferred contractual approach; and finally rolling out the contract as a standard practice to a large number of operational units. The rapid transition from the exploration to the exploitation of a successful practice is driven by competition in Winter and Szulanski’s (2001) two-stage model. While the English and Dutch highways agencies were under regulatory and political pressure to demonstrate improved importance, the absence of competition provide some protection enabling the two organizations to invest time, effort and resources in the front-exploratory stage of the replication life cycle, involving the creation of the original ideas and experimentation with alternatives formats.

Based on our study of the HA and RWS, we argue that these organizations have a pursued a more complex pattern of development than suggested by Winter and Szulanski’s (2001) two-stage model. Our revised framework explores the dynamics of knowledge generation and transfer along

two dimensions: the exploration of new “principles” and “working examples” and exploitation of this template across many simultaneous examples; and the interaction between dynamic and operational capabilities as the template is created, refined and prepared for rollout. We present a four-phase replication life cycle to identify the more fine-grained processes, decisions and transitions involved in the replication of practices in a non-competitive setting: (1) *envisioning* the idea or strategy to create a successful set of *principles*; (2) *selectively enacting* the initial vision or strategy in a few pilot projects to create a *working example*; (3) *reflecting* on the evidence gained from the pilot projects to select a standard practice or *template*; and (4) *executing* the roll-out of the *standardized practice* across many operational units. Winter and Szulanski (2001) identify the crucial role of a central organization which embodies the “dynamic capabilities” (Teece et al., 1996) required to move rapidly from exploration to exploitation by reproducing the standard practice across a large number of operational units. In addition, our research highlights the importance of “operational capabilities” (Helfat and Peteraf, 2003) in decentralized operational units responsible for experimenting, testing, and modifying alternative practices prior to their selection as a standard contract and reuse across multiple units.

The following section of the paper presents a review of the literature on replication, focusing on Winter and Szulanski’s (2001) lifecycle model. This is followed by a description of our research method. Next we present our comparative case study of the HA and RWS. Our discussion of the case study presents the revised four-phase model of replication, which is followed by a discussion of the limitations of the work and conclusions.

## **2. The Replication Process: a Review of the Literature**

The replication literature builds on Nelson and Winter’s (1982) original insight that knowledge is embedded in a firm’s organizational routines, which refer to the “regular and predictable behavioral patterns of firms” (Nelson & Winter, 1982: 14). Competitive advantage is (a) obtained by innovative creating new and innovative combinations of existing routines or (b) imitating and replicating

successful routines more rapidly than their rivals. Imitation and replication both refer to the reuse of standardized knowledge to improve performance (Kogut & Zander, 1992; Zander & Kogut, 1995). The cost of knowledge creation is mitigated as the same knowledge is spread over many units (Langlois, 1999). Replication is a costly and time-consuming process of copying and applying an existing routine on a larger scale (Nelson & Winter, 1982: 119). The existing routine is a “template” for the new ones. The benefits of replication must exceed the costs.

Research conducted in the 1990s was largely concerned with the influence of the “imitation” of best practices on competitive advantage (Rivkin 2000). Szulanski’s (1996) early research helped to shift the focus from imitation (or replication by competitors) to the replication of internal practices within firms, such as TQM, business process reengineering, benchmarking and other best practices (Szulanski, 1996). Whereas an imitator cannot directly observe the original practice, the replicator has an advantage because it can use detailed knowledge of the working template as a reference to support the replication process.

## **2.1 The Concept of Replication**

The aim of replication strategy is to identify successful organizational practices or superior routines found in part of the organization and reproduce them in new settings.

### ***2.1.1 Routines and Replication***

Szulanski (1996) believed that transfers of best practice should be conceptualized as “replications of organizational routines”. An organizational routine is codified and tacit knowledge embodied in an individual’s skills and in collaborative arrangements (Szulanski, 1996: 28; Nelson & Winter, 1982). Replicating a routine is an attempt to re-use a “similar routine” at a different location. Routines range from simple discrete activities to more complex connected activities or meta-routines, such as an entire production process, and a working example based on a routine consists of a “recurring set of behaviours” (Szulanski & Jensen, 2004: 349). The transfer of knowledge includes an exact copy or

partial replication of the original practice. The replica is not identical to the original routine because it involves the use of similar but different resources coordinated by a web of similar but different organizational relationships (Szulanski & Jensen, 2004: 349).

The transfer of a routine or practices involves dyadic and iterative exchanges of knowledge between a source and recipient unit, under a variety of organizational conditions that may favour or impede knowledge transfer (Szulanski, 1996: 28). Each dyadic relationship connects a web of coordinating relationships at the source location to a similar web of relationships at the recipient organization.

Replication can involve the exploitation of “templates” or “principles”, or some combination of the two (Szulanski & Winter, 2002; Baden-Fuller & Winter, 2005). A template is an existing routine or working example that serves as the working example and future point of reference for the reuse of knowledge. Replication by templates involves recreating an exact copy of an existing practice provided by the source. A principle makes no reference to concrete working examples. It outlines a set of principles that should be adapted and implemented by the recipient.

The most common examples of replication are medium to large organizations involved in the deployment, production or operation of standardized practices that seek to replicate their initial success across many units – such as retailing, branch banks, factories, and call centers – to achieve rapid growth in new geographical markets. Although replication efforts often result in failure (Szulanski & Winter, 2002: 63), a successful strategy can be highly rewarding. The profitability of a replication strategy is worked out by taking the revenue generated by a single standardized unit and multiplying it by the total number of replicated units (Winter & Szulanski, 2001).

### ***2.1.2 Conditions for Successful Replication***

Several authors identify the impediments to replication associated with knowledge complexity (Lippman & Rumelt, 1982; Rivkin 2000 & 2001).), “causal ambiguity” about the number of elements of knowledge and how they interact to produce the replicated outcome (Lippman & Rumelt 1982;

Szulanski, 1996) and “internal stickiness” associated with difficulties of transferring knowledge beyond its original context (Szulanski, 1996). Here we focus on the main conditions for successful replication: the source and recipient in the knowledge exchange, and organizational context of the exchange (Szulanski, 1996).

A source of knowledge may be an expert in the field. However, a source is not always willing to share his or her knowledge particularly if he or she is not sufficiently rewarded for devoting time and resources to the transfer of knowledge. Unless the source is perceived by the recipient to be reliable and trustworthy, he or she may be unable to initiate a successful transfer of knowledge. A recipient must be willing to absorb knowledge. A proven track record indicated by successful past performance is helpful in encouraging potential recipients to engage in the transfer. A recipient’s inability to accept knowledge from external sources may be due to a lack of motivation or an inability to exploit and retain external knowledge.

The transfer of knowledge between source and recipient is embedded in an organizational context. A context that enables the transfer of knowledge to flourish is described as “fertile”, whereas a context that hinders the gestation and growth of knowledge transfer is “barren” (Szulanski & Jensen, 2004: 354). An organization’s “retentive capacity” refers to its ability to absorb and institutionalize external knowledge (Szulanski, 1996). Knowledge may require several attempts before it has been successfully transferred due to the tacit component of the knowledge exchange, intimacy of connections between source and recipient, and ease of communication. The “arduousness of the relationship” (e.g. laborious or distant) between the source and recipient of knowledge also hampers the effectiveness of knowledge transfer. Szulanski (1996) suggests that these barriers to knowledge transfer may be overcome by investing managerial effort and resources into developing the learning capacities, encouraging closer cooperative relationships between units, and improving communication between source and recipient units.

## 2.2 The Replication Lifecycle

Replication has been treated as a process involving a lifecycle in the discovery and transfer of knowledge, practices and routines. Instead of relying on Szulanski's (1996) original four-stage model of replication, Winter and Szulanski (2001) introduce a more simple two-stage model for successful knowledge transfer based on a transition from "exploration" to "exploitation" (March, 1991).

### 2.2.1 *Two-stage model: exploration and exploitation*

The exploration stage in model occurs when the knowledge is created and refined. An organization seeking to replicate a practice must be flexible about what attributes can and should be replicated. Efforts to move to quickly to exploit a practice may lead to repeated failure due to repetitive copying of the initial working example. Organizations rarely embark on many simultaneous rollouts of untested practices due to the high costs and risks of failure, such as a copying a complex manufacturing plant. Instead, organizations create pilot implementations to test initial ideas prior to their selection and preparation for widespread deployment.

The exploitation stage occurs when the knowledge is stabilized and leveraged for widespread rollout. The concepts guiding the working example must be validated before commitments are made to achieve large-scale rollout. Attempts must be made to "freeze the design" so that attributes of the practice can be specified, standardized and sequenced for large-scale deployment. However, at a later stage in the implementation process subsequent target organizations and units can become test sites for incremental improvements to the original template.

The transition from the first to second phase is a "critical period in which the task is to create and the refine the capabilities that support the more routine replication activities that follow" (Winter & Szulanski, 2001: 731). The process of moving to exploitation involves a specific type of knowledge called the "Arrow core", which refers to Arrow's (1962) work on how knowledge is created through learning by doing. Arrow core is the knowledge acquired through learning about how attributes of the practice are created and which attributes are replicable and worth replicating

(Winter & Szulanski, 2001). Knowledge of the Arrow core cannot be known at the outset. It must be acquired through exploratory learning when the “historical template” is created. This is when the success must be demonstrated during initial exploratory efforts before a strategy for large-scale replication can be considered. As Winter & Szulanski (2001) point out “it is learning from experience that drives the strategic recognition that there is a success and that it may be a replicable success, not attributable to idiosyncratic factors or to good luck” (Winter & Szulanski, 2001: 734).

### ***2.2.2 Dynamic Capabilities of the Central Organization***

The speed of the transition depends on the capability of the replicator to “implement” those attributes successfully in new locations or units. These higher-order “dynamic capabilities” (Teece et al., 1997) refer to the knowledge and experience required to design and build new units, recruit and train staff, and ensure that necessary routines are put in place to procure resources and perform the tasks required to produce the product or provide the service.

A central organization must be created to house the dynamic capabilities required to mobilize and transfer the Arrow core across new locations and units (Winter & Szulanski, 2001: 732). The central organization is responsible for developing a repository of “working examples” or “templates” providing knowledge of how something works acquired as a result of learning from the first and each successive replication. The exploration phase may generate competing ideas for replication which must be tested prior to their selection for large-scale deployment. Some features of a practice may be tacit and difficult to codify into a guide-book, process, tool or technique to help with the implementation of a replication strategy. In the exploitation phase, the central organization is responsible for large-scale and rapid leveraging of the original practice.

Dynamic capabilities at the centre are improved through learning from experience each time there is a replication. Such capabilities include the replicator’s knowledge of the environment within which the practice is expected to create business value, the practice attributes that must be reproduced at each location or unit, and the tasks that must be performed to reproduce those

attributes. However, the content of each template is “causally ambiguous” (Lippman & Rumelt, 1982) and cannot be predicted or known from the outset. It must be learned from the cumulative experience of each replication. The capability to replicate increases over time as the experience gained from repetition reveals attributes of success in terms of fit with local environments, efficiency and reliability of the replication process. When creating a replica, however, the value of the template diminishes over time with each step removed from the original example (Szulanski & Jensen 2004).

After a long period of exploitation, the original template may no longer be used to guide the replication process. A “mix and match” heuristic may be followed as the new recipient units use the best attributes of the original template and experience gained to create a “perfect hybrid” to guide subsequent replication processes (Winter & Szulanski 2001; Szulanski & Jensen 2004: 350). In other cases, the replication team may ignore the original template, preferring to create additional units informed by ideas, plans or insights not founded upon experience. A successful replication can be based on a departure from the original template in order to encourage adaptation to the traits of varying local environments. However, there are risks associated with any departure from the original template because when a template is causally ambiguous this flexible replication strategy may be more costly and slower. Modifications required to adapt to local environmental conditions may create new problems for localized learning that cannot be resolved by referring to the original template. This “replication dilemma” involves a trade-off between the advantages of precision against those of learning and adaptation (Winter & Szulanski, 2001: 737; Szulanski & Jensen 2004: 349).

### **3. Research Methods**

This paper aims to answer the research question: How do different organizations strategically generate and replicate new standardized practices across operational units? We selected two public organizations from the infrastructure sector as our case studies: the HA in the UK and RWS in the Netherlands. The HA is responsible for operating, maintaining and improving England’s road network, consisting of 10,500 km. of single or dual carriageway roads and two, three or four lane

motorways. The HA currently has around 2,700 employees in an organization with one corporate centre (London), 7 regional control centres, a national control centre and 14 regional areas. RWS manages the main road network, the main waterways network and the main water supply and drainage systems in the Netherlands. The road network consists of 3,102 kilometres of main roads, 1,259 kilometres of entry and exit slip roads and link roads. In 2007 9,019 employees were working for RWS in 10 regional areas including 20 road districts and 16 water districts, 5 corporate centres, and 3 project directorates. The RWS was in the process of outsourcing more of its activities to the private sector in an overall strategy to become a more streamlined organization similar to the HA, which outsources 95% of its work.

### **3.1 Research setting**

The case settings were chosen for three reasons. First, both organizations are the executive arms of the Ministry of Transport of their countries responsible for developing, operating, and maintaining the national road network. Since infrastructure is a typical project-based industry, the ability to replicate knowledge from one innovative project to a suite of similar projects is an essential capability (Gann and Salter, 2000; Brady and Davies, 2004). By using two organizations involved in delivering very similar services, having almost identical skill profiles and financial governance structure alike we aspire to reduce potential bias caused by these contingency elements. Second, both organizations are under increasing political pressure to find more efficient, best practice and customer-focused ways to procuring and delivering services. They are searching identify more efficient contractual arrangements that can be rapidly deployed to improve the performance of their entire organizations. Third, since we are interested in developing a process-view of how organizations learn and build capabilities in replication, the two cases offered the opportunity to reveal similarities and differences in replication practices. Fourth, despite caution in making generic claims from case-based research we believe that the conceptual findings induced from the cases are not restricted to infrastructure

providers (e.g. water and energy). They are proto-typical cases which address essential aspects of the process of replication occurring in many public and private organizations.

### **3.2 Research design**

We adopted an inductive qualitative research method (Pratt, 2009) and followed Pettigrew's (1990) recommendation to use comparative real-time cases to study the process of organizational change. A qualitative research design was adopted which is more appropriate for addressing "...'how' questions - rather than 'how many' questions; for understanding the world from the perspective of those studied (i.e. informants); and for examining and articulating process" (Pratt 2009:856). Employing comparative qualitative case studies as a research tool is appropriate when the holistic nature of the real-world contexts and largely unexplored complex phenomena are addressed (Eisenhardt & Graebner, 2007; Yin, 1987). The dynamics of replication – including dynamic and operational capabilities – is a theoretically underdeveloped field. It is not clear how organization can move successfully from knowledge generation through the multifaceted transitions and interactions of different learning types to replication.

The research design was informed by two complementary approaches. First, we adopted Strauss and Corbin's (1990) adapted ground theory - an inductive method which acknowledges that some initial conceptual framing of the research phenomenon must undertaken. Second, we followed Van de Ven's (2007) engaged scholarship approach, which stresses research relevance and need to engage in a close interaction with the research object. The setting of a real-time study allows for a genuine process of continuous interaction between empirical data gathering and theoretical development.

The level of analysis of the research was the organization: the HA and RWS. Both cases represented sources of rich data providing detailed insights in the lifecycle of replication. The unit of analysis for the research was the development and implementation of new maintenance contracts. Interviewees referred to these contracts as complex projects suggesting that implementing and

managing the new contracts demanded novel sets practices. We focused on the contracts because represented the concrete expressions of the agencies' replication activities.

We initiated the study by entering into high-level discussions with managers from both agencies to identify the key research problem. We proceeded to set up the qualitative, case-study approach to explore and answer our research question. The close interaction with the research object and the people involved in the replication process gave us a detailed appreciation of the actual work, decision making and contexts.

Over a period of 20 months (between March 2007 to November 2008), we conducted 98 formal semi-structured interviews in the two organizations: 44 of these were conducted in the HA and 54 interviews in the Dutch RWS. Interviews are useful for understanding how people make sense of their work activities and the decision making processes of the wider organization (Barley & Kunda, 2001). We used a standardized, open-ended interview protocol. Interviewees were asked about: the work practices involved in developing and implementing the new maintenance contracts; the skills, experience and organizational design and support needed to perform activities; and the sequence of events, activities and decisions associated with the replication of the contracts. As our research progressed, the interviews became more targeted to accommodate specific themes of interest emerging from the empirical context as important, such as how learning supported each organization's replication process (Argote, 1999).

The interviews took place on site at the Dutch or UK highway agencies offices in Rotterdam and Den Haag in the Netherlands and in London, Bristol, and Birmingham in the UK. We interviewed senior managers in both agencies as they were the key decision makers shaping the replication process. Additional interviews were conducted with directors of regional offices implementing the contracts and staff in central corporate procurement departments and operational teams. Interviews were carried out by all three researchers in various pair-wise constellations. To provide a triangulating perspective (Jick, 1979), we interviewed a number of individuals in private contractor and consultancy firms.

Interviews (between 60 to 180 minutes) were recorded and transcribed for analysis. After each interview, the researchers had a short debrief session to consider the implications for the analysis and formulation of hypotheses. To secure validity in our findings, data gathering was supplemented by several focus-group meetings where we discussed our preliminary results, initial hypotheses and conceptual frameworks. These sessions generated further information and documentation about each organization's strategies, project reports, minutes and news briefs. The authors attended presentations at 11 workshops in the Netherlands and 4 workshops in the UK held by the two organizations. This enabled us to do some job shadowing and allowed us to participate in informal after-work sessions where our findings were further discussed and analyzed by HA and RWS staff. Such non-participant observation allowed for greater reflexivity in making sense of our interview material and assisted us in understanding how the organizations progressed through the stages of replication. Our qualitative work was complemented by use of secondary material (Suddaby 2006), including over 30 individual HA and RWS publications produced and UK and Dutch government reports, reviews and other publications on best practice in innovation, contract management, project management (see Appendix for a list of important publications).

### **3.3 Data analysis**

Adopting Strauss and Corbin's (1990) procedure, the descriptive findings from interviews and other data sources were manually coded into major thematic categories and concepts (i.e. first-order codes contained both conceptual and empirical codes). Informed by these codes, each case study was summarized and written up into a 50-70 page descriptive documents produced by all three authors. We used the emerging theoretical frame consisting of types of capabilities and organizational learning activities (exploration and exploitation) as a platform for our initial analysis. However, the literature on replication strategy provided the crucial theoretical breakthrough enabling us to develop propositions about what is expected to occur (Sutton & Staw, 1995). These were then taken to the next step in data collection for checking and revision. This step-by-step process formed the basis of

our second-order conceptual coding. Inspired by Yin's pattern matching technique (1987), which we recognize is mainly used for theory testing purposes we analysed the two cases for similarities and differences in their process moving from knowledge generation through to replication. Our findings are synthesized and presented in our conceptual framework in Section 5.

#### **4. Case Studies of Replication Processes in the HA and RWS**

This section describes how the HA and RWS developed strategies to introduce radically innovative forms of procurement, experimented with alternative contracts, selected and refined the preferred approach, before finally rolling out a standardized contract to many operating units. It discusses each case separately under consistent headings to facilitate the comparison of the empirical findings and development of concepts in Section 5.

##### **4.1 Case Study of the HA**

Over the past decade, the HA has deployed and reviewed a number of strategies to meet government objectives, to improve its procurement processes and to change its relationships with suppliers by responding to issues raised by a number of government-sponsored reports such as the Egan Report (1998) and the Nichols Review (2007). Since 2005 the HA has expanded its network operator role and has placed stronger emphasis on the needs of customers and users (HA, 2005a; 2007; HA, 2007). In this regard, procurement is a core capability of the HA which delivers 95% of its services through external suppliers. The procurement practice of the HA is embodied by new forms of contracts – such as Design, Build, Finance and Operate (DBFO) projects – which integrate different disciplines and activities under the responsibility of one supplier. This also includes the development and implementation of innovative forms of contract: the Managing Agent Contract (MAC) and Enhanced Managing Agent Contract (E-MAC) for the maintenance of road networks. In the following we elaborate the processes involved in developing, experimenting, selecting and deploying the MAC contract across the HA's operating units.

#### ***4.1.1 Developing the Principles***

In 2001 in response to both external policy pressures and goals for public procurement laid out in governments reports (e.g. Egan Report) and internal pressures to improve HA's performance the procurement office started to rethink the HA's procurement practice. Under traditional maintenance procurement the HA used two contracts: one with a Managing Agent (MA) and one with a Term Maintenance Contractor (TMC). Under both contracts, the client retained the risk on the asset, but transferred as much risk as possible to the MA and TMC. The contractor's costs are reimbursed as an agreed lump sum and target costs are specified at the tender stage. The MA worked directly for the client and employed a TMC to perform routine maintenance and small capital works below £250,000. The MA was responsible for the design, procurement and finance of projects.

The HA's procurement office was the central organization responsible reviewing the performance of the MA and the TCM contracts the procurement office and developing new types of innovative contracts to meet the government's objectives for improved procurement practices. The aim was to develop the "principles" of a new type of contract that would avoid waste and inefficiencies associated with the MA/TMC contracts, such as the situation of having "professionals checking the work of other professionals". Two new forms of contract were developed With the Managing Agent Contract (MAC) and Enhanced MAC (E-MAC) contracts the double supervision level was removed by having one single responsibility for delivering front-line maintenance services and developing a quality planning of how to achieve the HA's requirements.

#### ***4.1.2 Creating Two Working Examples***

A small number of the HA's operational units were selected to implement working examples of the new MAC and E-MAC contracts. They were responsible for applying and adapting the contractual principles to local requirements. The knowledge and experience gained from this process of experimentation was subsequently used in the selection of the HA's preferred procurement practice.

The MAC contract combined the roles of MA and TMC to create a prime contractor role called the MAC supplier. The HA performed the role of project sponsor and partner in an integrated project team with the MAC supplier, formed before the design phase and throughout the project delivery phase. Although the contract continued to be based on a lump-sum incentive structure, it included new performance specifications and the MAC contractor was now expected to be more actively involved in providing self-certification and self-control of its activities. The MAC contract was designed so that when a mistake or problem occurred during a project it was the responsibility of the HA and the MAC supplier to work as team in creating an appropriate solution. The team was responsible for maintaining project risk registers, holding risk workshops, and undertaking post-project evaluations.

The first MAC contract was implemented in HA's Area in 2001. However, the procurement office did not wait for feedback from the initial pilot project. In July 2002, it launched the first round of MAC contracts in three other HA Areas. One of these areas was Area 9 – a road network in the West Midlands consisting of 670 miles (1080 km) of routes. The duration of the contract in Area 9 was four years with an extension of three years depending on performance. In terms of ways of working and behaviour, the MAC contract represented a considerable change for HA staff.

Initially, the Area 9 MAC team worked relatively autonomously in developing its own approach to implement the new MAC contract. In addition, the people in HA's central procurement office responsible for developing the MAC contract left when the contract was awarded. During the first few months of the MAC, the Area 9 had insufficient knowledge or support from central procurement to help implement or make sense of this new type of contract. To make the MAC contract work in practice, the Area 9 team (HA and MAC supplier) had to work together to on their own without full knowledge of the principles underpinning the MAC approach. Members of HA's Area 9 project had to learn by examining the MAC procurement document and by discussing issues amongst themselves with no help from the centre. Apart from one or two procurement staff in Area 9, few people had a thorough understanding of the MAC contract. Many staff working on the MAC

Area 9 commission for the HA were redeployed from the traditional MA/TMC contract. These managers had considerable experience with the traditional client-led arrangement and found it difficult to make the transition to the new client role as a partner in an integrated project team. Both the HA and the MAC supplier invested considerable time during the first six months of the contract holding workshops to foster a culture of partnering amongst members of contractor's team. These efforts were very successful because at the outset of the MAC contract the old role distribution between MA agent and TCM contractor was still visible but within a year the old behavioural patterns disappeared. During the start-up phase of the MAC contract, the project team had only very little knowledge of how to proceed and a lot of things were worked out on the hoof. It took the HA team including the MAC contractor's staff around two years to build up the knowledge and experience to perform effectively using the MAC contract. Members of the team did not receive procurement training on MAC until at least one year after the contract was let. However, the training provided was rudimentary and it was assumed that the local team knew what they needed to know.

The E-MAC contract was an experimental improvement of MAC, which involved higher degrees of cooperation based on a cost-reimbursable contract. Under this arrangement, the HA reimbursed the contractor's costs and receives a share of the profits depending on its performance. The first and only E-MAC contract was applied to HA's Area 2 in Bristol and awarded to a consortium called InterRoute.

#### ***4.1.3 Selecting and Preparing a Single Template***

The HA's procurement office was responsible for measuring the performance of all of the maintenance contracts, learning from the experience of implementing the MAC and E-MAC contracts, and using the learning gained to improve existing generations of contracts or to develop entirely new generations of maintenance contracts. For example, they believed that cost certainty has not yet been achieved under the MAC contract. Thus, the MAC contract has been modified by including a new section which can provide more cost certainty within the existing MAC contract.

To capture the learning gained from the pilot projects and initial round of MAC and E-MAC contracts the HA central organization used two main auditing systems. The Traffic Operations Contract Compliance Audit (TOCCA) was responsible for gathering information from the operational units responsible for the contracts, and the Performance Review Improvement Delivery (PRIDe) – a central HA group – focused on improving the performance of contracts. Both TOCCA and PRIDe audit teams visited the maintenance areas over a period of a few days and identified how local projects introduced innovations or improved the performance of the contracts. For example, PRIDe was used to provide a critical evaluation of the operational effectiveness of the HA team and MAC suppliers' quality systems and procedures. PRIDe used external consultants in collaboration with in-house specialist to undertake detailed audit and review work and was used extensively by the HA's area maintenance supplier community to identify compliance failure, take remedial measures, and drive process improvements. The PRIDe team sent 'Focus on Best Practice' report sheets to each Area MAC team, inviting them to put forward examples of best practice on a regular basis which could be disseminated across the MAC areas.

The TOCCA and PRIDe audits were identified as useful informal mechanisms of learning from the client and contractor organisations in the local areas in three respects. First, the auditors identified additional areas for improvement not reported by the local units. Second, the grading systems provided by the auditors provide an opportunity for the local areas to present their results, offering an informal way of recognizing and rewarding the teams. Third, the auditors shared ideas about best practices and innovations deployed in other local areas with each team. However, the formal TOCCA and PRIDe audits were not considered by interviewees in the local as a useful way of sharing best practice. The Maintenance Community and Maintenance Best Practice Group including staff from the contractor companies across the HA maintenance areas was seen as far more successful mechanism for exchanging knowledge of best practice.

Such informal and formal learning played a role in the HA's decision to select the MAC contract rather than E-MAC as the preferred approach to procurement. However, this decision was

seen as slightly arbitrary because the E-MAC contract was regarded as successful by members of the local client and E-MAC contractor. The HA attempted to ensure that lessons learnt from the initial round of MAC contracts was used to incrementally improve subsequent contracts. For example, the procurement office provided the MAC team in Area 1 in Exeter with training advising the members of the team on what to expect during the implementation of the new contract. An HA manager from Area 9 also visited the Area 1 MAC to provide cross-learning from one MAC to another.

#### ***4.1.4 Rolling Out the Standardized Contract***

In 2004, the HA announced its decision to extend the 9 MAC agreements and give two-year extension to the original five-year MAC contracts. As Area 9 proceeded to implement its MAC contract over the subsequent years, the team did in fact benefit from learning acquired through HA's procurement office and from the other adjacent areas running MAC contracts. The HA's procurement office believed that the MAC contracts could be implemented consistently in a standardised way across the different areas. However, this has not been possible because the implementation of each MAC contract is tailored to the requirements of the local environment of each area, which vary in terms of the configuration of routes, density and type of traffic, and physical geography. The local learning shapes the implementation of each MAC contract to such a degree that contracting practices vary considerably even within a given local area.

## **4.2 Case Study of the RWS**

Since 2004 RWS has been undertaken considerable efforts to develop into a professional public-oriented network manager by focusing on the needs of the infrastructure users and increasingly engaging the private sector in the design, construction and management of its infrastructure. The ambition of the organization is to be recognized as the leading, sustainable and public-oriented executive organization of government in 2012 (RWS Annual Report 2007). Driven by policies of the Dutch government, RWS realigned its procurement strategy and its organizational structure to more

and more take on the role of a commissioning authority. New forms of contracts are introduced which primary aim is to reduce the direct engagement of RWS in designing, building, operating and maintaining infrastructure assets and to put suppliers in charge for integrated service packages. RWS actively seeks for improved relationships and knowledge sharing with the market and tries to stimulate the supply chain to develop innovative infrastructural solutions (RWS Annual Report 2007). In the following we describe how RWS developed and replicated a new form of procurement practice - the Integrated Performance Contract (IPC) – for the maintenance of the Dutch road network.

#### ***4.2.1 Developing the Principles***

The political pressure on Dutch public organizations to adopt radically improved forms of procurement encouraged the RWS to create new and more efficient forms of maintenance contracts. Over the previous decade or so, each road district in the regional areas of RWS had a number of single method-based contracts for routine and renewal maintenance with different contractors. For example, there were contracts for cutting the grass on the benches, cleaning the sewer system or repairing the asphalt. With method-based contracts awarded for the lowest price RWS precisely described what and when the contractor had to do maintenance work. RWS road inspectors scrutinized the condition of the motorways on a daily basis and if, for example, the grass became too high the contractor was called on to cut it. RWS strictly controlled the fulfilment of the contracts by measuring amount and quality of the delivered work. The payment of the contractor depended on the measuring outcomes.

In 2000 informed by experiences from other sectors the corporate management of RWS decided to introduce performance-based contracts. The main idea behind the new contract is to functionally describe the work a contractor has to deliver. Instead of stating when and how many asphalt damages have to be repaired, the work specification only involves the allowed unevenness and crack width of the asphalt. The contractor is responsible to recognize and remove possible

deviations of these performance criteria, but simultaneously obtains the freedom to optimize its own work processes. Rather than measure the amount of work the contractor performed, the RWS was now responsible for checking whether the work was done correctly, which helped to reduce the administrative workload.

#### ***4.2.2 Creating a Working Example***

The RWS's central procurement department established a working group to develop a standard performance contract. In practice, the approach taken to develop the contract was highly decentralized. Procurement and middle management in the RWS Regions actively took part in the shaping the development of the new performance contract.

A number of motivated and enthusiastic staff in the Noord-Brabant Region was strongly involved in the development of the new contract. Consequently in 2000 this area became a pilot project to test and learn from a new way of procuring maintenance called the integrated performance contract (IPC) contract. At the beginning the existing single contracts for different disciplines were gradually transformed into performance contracts of three to four years duration. However, in order to achieve a greater reduction of the administrative work the idea was born to integrate different disciplines of routine maintenance (e.g. asphalt repair, wastage, green spaces) in one contract. Soon after the first IPC was running, other regional areas started, again in cooperation with the procurement department, to introduce the new contract. These areas acted very autonomously with regard to the decision to apply the IPC and the adjustment of the contract to their own needs and local peculiarities.

#### ***4.2.3 Selecting and Preparing a Single Template***

The first evaluation of the IPC contract was done by the RWS's procurement department in 2005. However, this was the only limited attempt to use the learning gained from the pilot project to shape and improve the IPC. The lessons that were captured demonstrated that to work effectively the IPC

contract had to be accompanied by considerable behavioural change. For example, RWS staff had to make sure they avoided resorting to established behaviour associated with performing the actual tasks and concentrate instead on supervising and instructing the contractor. However, the task of how RWS staff should actually monitor work completed by the contractor was poorly defined. As result, there was scope for variation in how such tasks were carried out in practice. Similarly the tasks that the contractor should perform were not clearly prescribed, resulting in different interpretations of how the contractor should fulfil its contractual obligations. For example, the IPC specified that the emergency lane along a motorway had to remain clean and tidy. However, there often differences of opinion about whether the stated performance targets had been achieved, manifesting as tensions between staff in RWS and contracting organizations. The project teams working on the pilot IPC contracts had to create appropriate forms of behaviour to effectively such as new reporting procedures for evaluating performance.

The IPC evaluation in 2005 also found that there was very little information available at the local level about the maintenance conditions of the infrastructure. Much of the knowledge was tacitly understood by the RWS employees and could not easily be transferred to the contractor organizations. The evaluation found that this situation was not helped after a major reorganization of RWS in 1999 when a large number of RWS employees left the organization. As a consequence, the contractors had difficulties in making accurate judgements of the risks of the work and were often unable to make realistic offers. Since the situation was unknown when the IPC was awarded, the discussions between the RWS and contractor often ended in conflicts and differences of opinion about which maintenance activities were covered by the contract area. Therefore, in 2006 the RWS management assigned a director of a regional area to work on an asset management system for RWS and its implementation. It soon became obvious that asset management was a more complex activity than originally envisaged when the IPC was developed.

#### ***4.2.4 Rolling Out the Standardized Contract***

In 2004, RWS introduced its new procurement strategy the labelled “the market unless” and the IPC became the standard performance contract all of the RWS regions. The RWS central procurement department’s evaluation of the IPC contract recognized that the rollout of this procurement practice had to be accompanied by a programme of training. Initially, the procurement department offered courses to support the technical aspects of the new contract. However, these were deemed insufficient and new training course were developed to the behavioural issues between client and contractor. The procurement department also established the “users’ day”, which met twice a year to provide all operational staff members of RWS working with IPC’s to exchange their experiences and best practices. However, despite training and knowledge sharing, a second evaluation in 2007 found that efforts to standardize behavioural aspects of the contract had not been fully accomplished. There was still a great deal of variation in the ways in which RWS’s local units used the IPC to monitor, control and document the performance of the contractor organizations.

## **5. Discussion**

Our case studies were structured to examine the lifecycle of processes involved in the generation and replication of knowledge in two different organizational contexts. We draw upon our empirical findings to suggest that Winter and Szulanski’s (2001) two-stage model should be modified and presented as a two-by-two matrix of replication activities. Subsequently the matrix is used to interpret the case study findings and identify the four phases of the road to replication.

### **5.1 The Replication Matrix**

Despite recognizing that the transition from exploration to exploitation is achieved through dynamic capabilities, Winter and Szulanski (2001) model ignores the role of “operational capabilities” in the lifecycle of practicing, refining and replicating a routine. By introducing operational capabilities into our discussion we aspire to provide an analysis of the different levels of organizational capabilities

involved in the process of replication. We hope this will offer improved prescriptive advice to managers and organizations seeking to gain advantage by using the two-stage model to guide their replication activities.

A large volume of research uses the concept of dynamic capabilities to analyze strategic change (e.g. Teece et al., 1997; Zollo & Winter, 2002, Helfat & Peteraf, 2003; Teece, 2007). Dynamic capabilities refer to “the firm’s ability to integrate, build, and reconfigure internal and external competencies in address rapidly changing environments” (Teece et al., 1997: 516). Helfat and Peteraf (2003) argue that all capabilities have an ability to accommodate change, and that learning and adaptation do not necessarily depend dynamic capabilities. Adopting an evolutionary perspective (Nelson and Winter, 1982), organizational capabilities should be treated as a set of routines (Winter, 1995; Winter, 1996 & 2000; Zollo & Winter, 2002; Helfat & Peteraf, 2003) defined as a “repetitive pattern of activity” (Nelson and Winter, 1982).

Helfat and Peteraf (2003: 999) distinguish between operational and dynamic capabilities, based on different sets of routines. Operational capabilities refer to routines that perform an activity or coordinate the variety of tasks involved in the production of an output, such as a product or service. “Operational capabilities enable the organization to earn a living in the present” (Helfat et al., 2007:1). Dynamic capabilities refer to a set of high-level routines to build, integrate and reconfigure operational capabilities. Although they are not employed to produce a direct output, such as product or a service, dynamic capabilities do “indirectly contribute to the output of the firm through an impact on operational capabilities” (Helfat & Peteraf, 2003: 999). Both types of capabilities depend on routines to perform individual tasks or coordinate those individual tasks (Helfat & Peteraf, 2003). An initial attempt at performing an activity does not constitute a capability, but does indicate the initial emergence of capability. The performance of an activity can only constitute a capability if the activity has obtained “some threshold level” of reliable and repeatable performance (Helfat and Peteraf, 2003: 999) and benefited from the accumulation of experience over time. This performance-based view of capability is compatible with Winter and Szulanski’s (2001)

model of replication which involves the time-consuming process of identifying a reliable a routine offering superior performance (a capability), scaling up and exploiting it.

There are some similarities between the exploration-exploitation and dynamic-operational capabilities dimensions. Although both sets of concepts refer to the development and use of knowledge, they are treated as two dimensions in the replication matrix illustrated in Figure 1 because they emphasize distinct aspects of learning, adaptation and capability development over time. As Winter and Szulanski (2001) argue, the tradeoff between exploration and exploitation discussed in March (1991) can be seen as a transition between “two stages” of organizational learning over time. By contrast, classification of capabilities implicitly assumes that capabilities are types of routines located at “two levels” of an organization, analogous to Chandler’s (1990) strategic and functional capabilities and Porter’s (1996) distinction between strategy and operational effectiveness. Dynamic capabilities are higher-order and “top-down” strategic activities performed by centralized organizations that integrate, build and change operational capabilities. Indeed, in Winter and Szulanski’s (2001) two-stage model, dynamic capabilities are housed in a central organization responsible for integrating, adapting and transferring routines across operational units. We suggest that operational capabilities are the “bottom-up” operational activities or functions performed by many decentralized units directly involved in the production of products and services.

*< insert Figure 1: The Replication Matrix >*

In our case studies, the dynamic capabilities of the HA and RWS were embedded in central organizations, particularly the corporate strategy units and procurement departments. The operational capabilities of HA and RWS were embodied in decentralized organizations – the operational units in the geographically dispersed areas and regions. We have modified the two-stage model to account for our findings. As illustrated in Figure 1, a matrix of activities identifies two dimensions of the replication process: exploratory and exploitative activities; and dynamic and

operational capabilities. Just as the explore-exploit dimension is essential in identifying stages of organizational learning, we also need to consider dynamic and operational capabilities to fully understand the different types of capabilities and where they are located in the replicator organizations.

## **5.2 Replication Paths**

The matrix can be used to plot four phases in the lifecycle of replication activities. Next, we apply the matrix to compare and contrast the approaches adopted and pursued by the HA and RWS to achieve successful replication. Our analysis focuses on the changing roles of source and the recipient in the transfer of knowledge, organizational context of the exchange and the impact of differences in institutional settings on the replication process.

### ***5.2.1 Phase One: Create the Principles***

The first phase of replication – shown in the top left quadrant of the matrix – creates a set of principles (Baden-Fuller and Winter, 2005). The dynamic capabilities of central organizations are activated to explore and develop new principles that can achieve their strategic objectives.

In response to a changing political exigencies and regulatory pressures during the 1990s and early 2000s, the HA and RWS strategy units developed radically new corporate strategies and procurement policies. The procurement departments were responsible for translating strategic visions into radically new forms of contract. The new contractual principles were therefore the result of a search to find innovative solutions to political pressures to improve public procurement, reduce waste and bureaucratic inefficiencies, and make greater use of the private sector.

The HA and RWS procurement organizations acted as repositories of past operational experience and contractual knowledge. However, the principles underpinning MAC and IPC represented a break with traditional practices. The HA Areas and RWS Regional were not consulted at this stage because their operational capabilities were associated with previous contractual routines,

experiences and practices, which were considered by the procurement organizations as a potential hindrance to efforts to develop radically new principles. Instead, the procurement departments leveraged dynamic capabilities by drawing extensively upon government reports, consultancy studies and knowledge of successful procurement practices found in adjacent infrastructural industries for inspiration.

### ***5.2.2 Phase Two: Create the Working Example***

The second phase in the replication process – the bottom-left quadrant in the matrix – is initiated by an exchange between the source and initial recipient of the new contractual principles. In this phase, a few pioneering operational units are selected to translate the new contractual principles into concrete working examples, learn from the pilot projects, and transfer knowledge gained back to the central organizations. These units can play an ambidextrous role in this exploratory phase of replication, initially as recipient and subsequently as a source in the ongoing exchange of knowledge with the central organizations. Although initial attempts to apply the principles in practice do not constitute an operational capability, the principles are gradually tested, adjusted to achieve a reliable levels of performance measured against the original performance targets.

In both the HA and RWS, a single operational unit was selected to apply, practice and test the new contractual principles. These units identified what worked and what did not work as they attempted to implement the new contracts. But as one manager put: *“success doesn’t come automatically; you have to keep on testing”* (interview). In both cases, the new contractual principles – such as contractor self-certification – called for members of project teams to learn new roles, responsibilities and behaviors before improvements in performance were obtained. However, the operational capabilities of HA and RWS were used in very different ways in this phase of exploration.

Under a highly centralized regime, the HA procurement office developed two different contracts – MAC and E-MAC – and instructed two specific operational units to test out the competing principles. For the initial two years of implementation, the HA areas were largely left to

work out and apply the new contractual principles with little help from the centre. As one of the HA Area 9 managers put it, a major lesson learned was that the procurement office “*should have helped us with a lot more training*” (interview). The staff involved felt that the learning gained by the team would not be used in the development and revision of subsequent versions of the contract. The procurement office moved quickly to launch subsequent MAC contracts rather than waiting to receive feedback on the initial experiments. Compared to the Dutch experience, the HA’s operational units were initially treated as one-way recipients of top-down knowledge which was assumed to be clearly articulated and easily transferable. Valuable tacit and informal knowledge gained by the pilot units during the delivering of the new contracts (e.g. new forms cooperation with contractor organizations) did not play a strong role in the selection and subsequent revisions of the MAC contract.

In the Netherlands, the Noordt-Brant region responsible for delivering the new IPC contract was treated initially as a recipient of the principles handed down from the centre. It also worked autonomously in developing and refining the principles during the pilot test of the contract with little intervention from the central procurement department. However, this pioneering operational unit later became as a source of knowledge helping RWS’s procurement office to understand the detailed practicalities of implementing the new contract.

### ***5.2.3 Phase Three: Select and Prepare Template for Rollout***

In next phase of replication – the top-right quadrant of the matrix – the central organizations utilize dynamic capabilities to reflect on lessons learnt during the previous exploration phase, modify and select the preferred contract approach, and prepare a standardized template for responsible for large-scale exploitation by the operational units.

In both of our case studies, the central organizations were under political and regulatory pressure to provide “quick wins” showing how the new contracts offer visible improvements in performance. But the new practices took time to prove their worth. In both cases, the procurement

departments assumed that the initial principles were sufficient to develop a standardized template. Initially, they made little use of the detailed knowledge of processes and numerous modifications implemented to make the contracts work more smoothly generated during the delivery of the pilots, such as co-location and working in integrated project teams with private sector consortiums. Formal audits and evaluations of the contracts conducted by the central procurement organizations were more important in the initial selection of the standardized template. In the case of the HA, the procurement organization selected the MAC as the preferred contract before waiting to receive feedback on operational performance. In the Dutch case, the evaluation of the contract in year one and year three after implementation identified important changes in behaviours that required training and support to ensure an efficient rollout of the IPC among the regions.

What the knowledge generated by the operational teams did eventually demonstrate was that standardized contracts would be interpreted in different ways at the local level and had to be adapted to the unique circumstances of each contractual relationship, the specific challenges of road networks, and different geographical conditions in each area. The HA and RWS central organizations both recognized that they next phase had to strike a balance between the standardization of the contract and local adaptation of operational practices.

#### ***5.2.4 Phase Four: Replicate the Routine***

In the final phase of replication – the bottom left quadrant in the matrix – a standardized template is promulgated by the central organization and implemented across many or all of the operational units. In this phase of exploitation, operational capabilities must be honed and developed to achieve sustained improvements in performance over time.

In both cases in our study, the standardized contract was gradually implemented in phases – usually when previous contracts expired – across the entire operational units of the HA and RWS. To support the organization-wide deployment of a standardized practice that met the particular requirements of each area, the operational teams were given some latitude to make adjustments the

specific contexts using the contract as systematic and structured guide to inform practice. For example, the RWS allowed the regional units to adjust the IPC contract to local requirements. Formal audits conducted by the procurement units and feedback from the decentralized units on the operational performance of initial and subsequent contracts during this phase of full exploitation enable minor adjustments and improvements to the standardized approach.

Therefore, our research confirms Helfat and Peteraf's (2003) view that while dynamic capabilities are required to integrate, build and reconfigure routines, operational capabilities must also be able to accommodate learning, adaptation and change. At the end of the replication process, the operational units become important again in incrementally refining, scaling up and achieving the threshold level of performance required to turn the standardized template into an efficient operational capability. Support during this phase was provided by central procurement. For example, the HA procurement office acted on the experience of the first MAC contracts and provided the training the area teams required to implement the contracts. In addition, the pioneering recipient HA units became an important source of practical advice helping subsequent units to overcome the challenges encountered during rollout.

### ***5.2.5 Comparison of Replication Paths***

Although the case studies have enabled us to identify generic phases in the process of replication, our findings suggest that the particular organizational context of the exchange between source and recipient must be placed in the “institutional setting” of each country’s social, political and economic context. Whereas previous studies have focused on replication under competitive conditions, an understanding of replication processes in regulated industries has to take into account changes in institutional settings as a key driver of organizational innovation in the public sector practices (Shonfield, 1965; Hulsink, 1999; Walker, 2006; Edler & Georgiou, 2007). Differences in the speed and characteristics of replication trajectories are partly attributable to a variety of social institutions, political exigencies and regulatory pressures.

Despite facing similar pressures to introduce new forms of procurement contracts, the HA and RWS have followed contrasting paths of replication. The HA's replication process occurred in the context of the UK's highly centralized, top-down management and fast-moving policy-driven environment. Its replication strategy emphasized the advantages of moving as rapidly as possible through the four phases of replication. The HA's strategic objectives were quickly translated into principles and developed into standardized contracts. The replication process was led throughout by the HA's highly centralized procurement department and supported by formal structures and auditing mechanisms to capture learning gained, with minimal input from the operational units. In drafting the MAC contract, the procurement team received input from external consultants that drew upon their wide knowledge of construction, leading edge clients and other infrastructural industries. The HA's top-down replication strategy reflected a management ethos oriented towards continuous and rapid implementation of organizational change. As one of HA's managers put it, this is an organization that is "*addicted to change*" (interview). The procurement organizations quickly decided on the preferred form of contract, imposed this on the operational units and expected them to make rapid adjustments to their routines with little support from the centre. Initially the operational units were largely left to their own devices and even during later phases there were only limited opportunities for using the learning gained during implementation in revisions of the MAC contract. The HA's replication relied heavily on dynamic capabilities in defining, selecting and implementing a standardized contract for large-scale deployment. However, HA's operational capabilities played a more passive role in the process and there was little time for reflection and learning during each phase, particularly during development of the working examples of EMAC and MAC. For example, a decision to select MAC as the preferred template was taken before the learning gained during the implementation of E-MAC contract had been evaluated.

In the Netherlands, by contrast, the RWS's path of replication was conditioned by the decentralized, bottom-up management, and slower pace of the Dutch participatory and consensus-driven policy environment. The RWS moved more slowly through each replication phase in a

deliberate attempt to utilize learning gained by the operational units before selecting and refining the preferred form of contract. Considerable time was taken in consulting various stakeholders and developing and translating a strategic vision into an agreed set of principles. The Noordt-Brabant Region of the RWS, responsible for experimenting with the first IPC pilot project, provided direct input into the content of the standardized contract. After an initial delay, the RWS regions worked closely in a horizontal and supportive relationship with the procurement department. The IPC contract was developed jointly and iteratively over time by the RWS central and operational units. During large-scale rollout, RWS's operational units were consulted regularly to provide feedback on the performance of the IPC contracts. By leveraging its operational capabilities in this way, the RWS emphasized the advantages of learning and "getting it right first time". Whereas the rapid rollout of the HA's MAC contract provided few opportunities for reflection, RWS's replication process was more protracted while feedback gained from practice was used to modify and incrementally improve the IPC contract. Although regarded by those involved as painstakingly slow, the RWS's replication strategy can be seen as an attempt avoid being locked into an unsuccessful form of contract, which requires costly corrective revisions at a very late stages of the process.

## **6. Conclusion**

This paper provided an in-depth analysis of the process of replication in two large organizations. Building on Winter & Szulanski's (2001) observation that replication should be conceptualized as a process, we developed a replication matrix to illustrate the dynamics of the replication process along two dimensions: first, the exploration of new a principle and working example and exploitation of this standard practice across many simultaneous examples; and, second, the interaction between dynamic and operational capabilities as the practice is created, refined and standardized for large-scale deployment.

We sought to extend Winter and Szulanski's (2001) contribution by providing a more fine-grained conceptualization of four phases in the lifecycle of replication activities: (1) the translation of

a strategy into a set of principles; (2) receiving the principles and implementing them as working examples; (3) using the working examples to create a standardized template; (4) and the large-scale deployment of the standardized routine across many units. In contrast to Winter and Szulanski (2001), the replication matrix emphasizes the importance of the front-end exploratory processes involved in preparing principles and working examples. In addition to the dynamic capabilities located in central organizations in Winter and Szulanski's (2001) framework, our framework accounts for the role of operational capabilities housed in decentralized units that are activated in different ways during and between the phases of exploration and exploitation. The operational capabilities and exploratory learning acquired by the pioneering recipient units (in phase 2) subsequently became an important source of knowledge transfer to many other recipient units during the rollout of the standardized contract (in phase 4).

The empirical analysis of the highways agencies in England and the Netherlands was used to generate the conceptual framework to analyze and interpret the different roads of replication followed by the HA and RWS. The replication matrix may be useful in helping managers and organizations in other industries to prepare replication strategies and avoid embarking on a "road to ruin". The fundamental challenge is to move as rapidly as possible through the four phases, while providing sufficient time to reflect, capture and learn from the experiences gained at each stage. Time devoted to learning from phase two of the replication process is critically important because as our study of HA and RWS showed there may be a tendency for organizations to move too quickly to phase three without taking on board the exploratory knowledge gained while creating and adapting the working examples. What is surprising is that both organizations inaugurated this activity as a key phase of replication process, but neither fully capitalized on the experience before moving to the next phase. We hope that the replication matrix can provide useful guidance to managers seeking to anticipate and identify problems that can occur during the replication process, such as when an organization tries to accelerate too quickly (too little time for reflection), misses out a phase in the process, or moves too slowly.

Since our study included only two cases from one industry, further research should study a larger number of cases in the same or similar regulated industries. It would be interesting to consider whether our replication matrix and phases of activity in the replication lifecycle apply to studies of organizations in other institutional settings and competitive environments. Theoretically, it would be challenging to investigate the role played by third parties, such as consultants or contractors, in the various phases of the replication lifecycle.

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## **Appendix: Secondary Source Documents: the HA and RWS**

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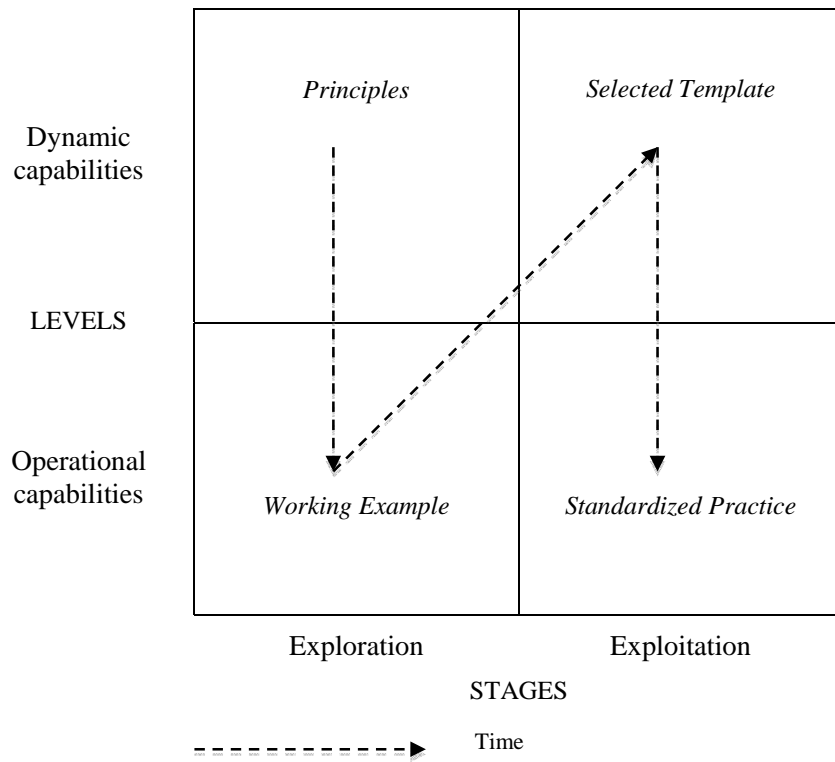
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**Figure 1: Replication Matrix**