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The organizational design of offshoring

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Marcus Møller Larsen

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The organizational design of offshoring

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Abstract

Offshoring can be defined as the relocation of organizational tasks and services to foreign locations. Increasingly, firms experience that unforeseen costs and difficulties of managing offshoring undercut anticipated benefits; that unexpected challenges of offshoring jeopardize and eventually undermine initial objectives. Guided by the research question—*what are the organizational consequences of offshoring?*—the purpose of this thesis is to investigate why some firms fail when offshoring and other do not.

The thesis consists of four research papers using various datasets and methodologies that investigate offshoring in an organizational context. The first paper investigates how the complexity of offshoring leads to ‘hidden costs’ of implementing offshoring activities. The second paper looks at how these hidden reconfiguration costs influence the process performance of the offshored activity and how this relationship is moderated by the modularity of that activity. The third paper investigates the effect of the organizational reconfiguration of offshoring on firms’ strategies. The final paper studies different strategies of adaptation in offshoring.

Taken together, this thesis argues that whether firms relocate activities with the purpose of accessing resources or as a response to political pressures, the process of offshoring presents firms with the challenge of coordinating and integrating offshoring activities in a global organization. The complexities and uncertainties of an organization consisting of a number of offshored activities (in contrast to an organization with only co-located activities) require firms to invest additional resources in coordination mechanisms so that an efficient reintegration can be achieved.

Abstrakt

Offshoring kan defineres som relokaliseringen av organisatoriske oppgaver til utlandet. Virksomheter opplever ofte at uforutsette omkostninger og vanskeligheter oppstår når man offshorer. Dette kan underminere forventede gevinster og til slutt undergrave det opprinnelige formålet med å flytte aktiviteter til utlandet. Med problemstillingen—*hva er de organisatoriske konsekvensene av offshoring?*—er hensikten med denne oppgaven å undersøke hvorfor noen virksomheter mislykkes med offshoring og andre ikke.

Oppgaven består av fire forskningsartikler som tar i bruk forskjellige datasett og metoder for å undersøke offshoring i en organisatorisk kontekst. Den første artikkelen undersøker hvordan kompleksiteten i offshoring fører til 'skjulte omkostninger' som oppstår når virksomheter implementerer aktiviteter i utlandet. Den andre artikkelen ser på hvordan disse skjulte rekonfigureringomkostningene påvirker prosessytelsen til den relokaliserte aktiviteten, samt hvordan dette forholdet er moderert av aktivitetens modularitet. Den tredje artikkelen undersøker effekten av den organisatoriske rekonfigurering av offshoring på virksomheters strategier. Den siste artikkelen ser på forskjellige tilpasningsstrategier i offshoring.

Et gjennomgående argument i oppgaven er at prosessen med å offshore gir nye utfordringer bundet til å koordinere og reintegrere de relokaliserte aktivitetene i en global organisasjon. Dette er uavhengig om virksomheter offshorer aktiviteter for å få tilgang til nye ressurser eller som et svar på politisk press. En høy grad av offshoring (i motsetning til en organisasjon med bare samlokaliserte aktiviteter) fører til mer kompleksitet og usikkerhet. Dette betyr at virksomheter må investere ytterligere ressurser i å koordinere aktiviteter på tvers av landegrenser for at en effektiv reintegrering skal oppnås.

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Marcus Møller Larsen

Copenhagen, October 2012

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Chapter 1

The organizational design of offshoring: An introduction

1.1 PURPOSE OF THESIS

This thesis investigates offshoring in an organizational context. Offshoring can be defined as the relocation of organizational tasks and services supporting domestic and global operations to foreign locations (Lewin and Peeters, 2006; Contractor *et al.*, 2010). This can be done internally in the firm or externally with an outsourcing partner. Driven by objectives such as cost reduction, market proximity, and access to strategic resources, the scale and scope of offshoring as a business practice has in recent years reached unprecedented levels with firms relocating tasks and activities from the entire value chain, including research and development, manufacturing, distribution, services and back-office functions (e.g., Doh *et al.*, 2009; Lewin *et al.* 2009).

Increasingly, however, firms are caught up by the “*harsh realities of offshoring*” (Aron and Singh, 2005: 135). A number of firms experience that unforeseen costs and difficulties of managing offshoring undercut anticipated benefits (Barthélemy, 2001; Dibbern *et al.*, 2008; Stringfellow *et al.*, 2008). Reports suggest how firms are increasingly concerned by how factors such as service quality and operational control and efficiency may be undermined when offshoring (Lewin and Couto, 2006). For example, many firms fail to pick up the right processes and calculate the operational and structural risks to live up to their initial expectations of the offshoring activities (Aron and Singh, 2005). Firms experience that costs erupt beyond

expectations relating to controlling the performance and coherency of the offshored activities, coordinating and integrating the domestic and foreign resources to achieve the specified objectives, accurately specifying and designing the business tasks to be offshored, and transferring and communicating knowledge between the domestic and foreign location (Dibbern et al., 2008). Consequently, many firms find that unexpected challenges of offshoring jeopardize and eventually undermine initial objectives.

The overall purpose of this thesis is to investigate why some firms fail when offshoring and others do not. In fulfilling this purpose, offshoring is conceptualized as an organizational reconfiguration. In contrast to a firm consisting of only co-located activities, offshoring implies an organizational change in which firms must coordinate and integrate geographically dispersed activities across distances. This raises a number of challenges. For example, how does the added distance between the organizational activities signified by offshoring impact task interdependencies? How do bounded rational decision makers account for and plan the organizational change from co-location to geographical dispersion? How do firms accumulate architectural knowledge so that efficient design decisions can be taken when relocating certain activities to foreign locations? This thesis consists of four distinct research papers using various datasets and methodologies that investigate different aspects of the organizational process of relocating firm activities to locations outside the home country. The research question guiding this thesis can therefore be formulated as follows: *What are the organizational consequences of offshoring?*

The remainder of this introduction chapter is organized in three parts: First, to place the thesis into a larger context, the next section presents the evolution of offshoring as a business practice and extant offshoring research. Second, the theoretical perspective applied in this thesis

is presented. Finally, the research design including the empirical foundation and the content of the four research papers is presented.

1.2 CONTEXTUALIZING THE THESIS

The evolution of a practice

Over the last decade, a substantial amount of research has been devoted to understand the offshoring phenomenon.¹ Research in fields such as international business and strategic management has looked into questions relating to the antecedents of why firms relocate activities abroad, the characteristics of the specific implementations, and the outcomes of offshoring. The practice of offshoring is not new, however. Over the last 50 years, firms have practiced various forms of offshoring. In the 1960s, firms (particularly from the U.S.) began to relocate blue-collar manufacturing activities to low costs countries, such as Singapore and South Korea (Ferdows, 1997). In order to cut production and labor costs, firms would close domestic facilities by instead setting up factories in locations with favorable factors markets. This early offshoring trend was also picked up by scholarly communities. For example, Vernon (1966) notes that production is typically moved to developing countries toward maturity stage of the product life cycle. In the 1970s, scholars like Leontiadis (1971) and Moxon (1975) began to recognize the strategic importance of relocating labor-intensive activities from developed countries to less-developed countries, in which “*soaring wage costs in the industrialized countries raise the prospects of wholesale movements of industrial facilities across national boundaries*” (Leontiadis, 1971: 20).

¹ Many different terminologies have been used to describe offshoring, such as international and global outsourcing, offshore outsourcing, captive offshoring, international sub-contracting, far-shoring, near-shoring, etc. While the different terminologies may point to different aspects of offshoring (e.g., mode of governance; choice of location), they all point to the process in which firms relocate activities to foreign locations in support of domestic or global operations.

In the early 1990s, the information and communication technologies revolution increasingly enabled firms to rapidly organize and locate activities and processes almost anywhere in the world (UNCTAD, 2004). Factors such as dramatic drops in IT costs, domestic shortages of skilled technological and managerial personnel, accelerated rates of technological change, and greater codification of corporate knowledge enabled firms to relocate tasks and activities to more distant and preferable locations (Contractor *et al.*, 2011). Consequently, firms went beyond the mere relocation of labor-intensive manufacturing activities, and to a larger extent began to relocate services activities such as information technology and other business processes, but also more complex and higher value-added tasks, such as innovation and product development, to attractive locations (Lewin and Peeters, 2006; Manning *et al.*, 2008). For example, Lewin *et al.* (2009) find that Western firms are due to domestic shortages of qualified personnel increasingly offshoring innovation activities such as engineering, research and development and product design.

Accordingly, offshoring practice has shifted from the sole relocation of labor-intensive manufacturing activities to also encapsulate more knowledge-intensive business service activities. Moreover, offshoring as a business practice is no longer only confined to restricted labor intensive firm activities such as scale production and call-center activities, but essentially encompasses the reallocation of firm tasks and activities from the entire value chain. Contractor *et al.* (2011: 39) argue that “*The explosive increase in the geographical relocation and reorganization of economic activity in the last two decades is a reflection of (i) necessity (the intensification of competition faced by companies because of globalization and liberalization of trade and investment regimes); and (ii) the means to do so (i.e., the precipitous drop in*

transport, data transmission, and tariff costs—so that output can be relocated much farther afield from consumers than ever before).”

This discontinuity in the evolution of offshoring practice has spurred much research seeking to understand the magnitude, characteristics and consequences of offshoring (see next section for a review). This thesis should be read as a continuation of and contribution to this scholarly debate.

Research on offshoring

Offshoring research can be divided into three major streams (see Table 1.1 for an overview). These are: the antecedents of offshoring, the characteristics of the offshoring implementation, and the outcomes of offshoring.

Antecedents

Research investigating why firms relocate activities abroad emphasizes three broad factors: environmental factors, firm strategy, and organizational factors. First, much research has investigated how home and host country environmental factors such as institutional frameworks and macro-economic contingencies drive firms to offshore activities (Contractor *et al.*, 2010; Dossani and Kenney, 2006; Lewin *et al.*, 2009). For example, Lewin *et al.* (2009) point out that restrictive home country immigration policies have reduced the supply of talented scientists and engineers, and, as a result, firms must relocate innovation activities abroad in a “*global race for talent*.” Manning *et al.* (2008) find that national development policies in host locations have led to the emergence of new geographic clusters in emerging economies that are being used as offshoring hubs by global firms. Research has also pointed out how general advancements in

ICT and the modularization and commodification of firm activities lead firms to offshoring (Contractor *et al.*, 2010; Dossani and Kenney, 2006).

Table 1.1 – Important offshoring research topics and contributions

<i>Antecedents</i>	<i>Implementation characteristics</i>	<i>Performance</i>
<p><i>Environmental</i></p> <ul style="list-style-type: none"> • Macro (Dossani and Kenney, 2006; Lewin <i>et al.</i>, 2009). • Institutional (Manning <i>et al.</i> 2008). <p><i>Strategic orientation</i></p> <ul style="list-style-type: none"> • Efficiency-seeking (Manning <i>et al.</i>, 2008, Kedia and Lahiri, 2007). • Market-seeking (Hutzschenreuter <i>et al.</i> 2011a; Martinez-Noya and Garcia-Canal, 2011). • Resource-seeking (Javalgi <i>et al.</i>, 2009; Lewin <i>et al.</i>, 2009). <p><i>Firm-level effects</i></p> <ul style="list-style-type: none"> • Experience (Hätönen, 2009; Jensen, 2009; Maskell <i>et al.</i>, 2007). • Size (Roza <i>et al.</i> 2011). 	<p><i>Activities</i></p> <ul style="list-style-type: none"> • Services (Jensen and Pedersen 2011; Manning <i>et al.</i>, 2008). • Production (Mudambi and Venzin 2010). • R&D (Nieto and Rodriguez 2011). <p><i>Location</i></p> <ul style="list-style-type: none"> • Local factor markets (Demirbag and Glaister, 2010; Hahn <i>et al.</i>, 2011; Graf and Mudambi, 2005). • Cultural distance (Hutzschenreuter <i>et al.</i>, 2011a). • Far and near-shoring (Bunyaratavej <i>et al.</i> 2008; Hahn <i>et al.</i> 2011). <p><i>Governance mode</i></p> <ul style="list-style-type: none"> • Captive (Lewin and Peeters, 2006). • Outsourced (Manning <i>et al.</i>, 2011). <p><i>Coordination</i></p> <ul style="list-style-type: none"> • Tacit coordination (Srikanth and Puranam, 2011). • Task interdependency (Kumar <i>et al.</i>, 2009). 	<p><i>Financial</i></p> <ul style="list-style-type: none"> • Cost savings (Lewin and Peeters, 2006). • Export performance (Bertrand, 2011). • Return on investment (Mol <i>et al.</i> 2005). <p><i>Non-financial</i></p> <ul style="list-style-type: none"> • Innovation (Nieto and Rodriguez 2011). • Learning (Jensen 2009). • Implementation time (Hutzschenreuter <i>et al.</i> 2011b). • Hidden costs (Dibbern <i>et al.</i> 2008).

Second, much research has emphasized a number of strategic drivers underlying firms' offshoring decisions (Manning *et al.*, 2008, Kedia and Lahiri, 2007). Perhaps the most acute driver of offshoring is the desire to exploit global competitive costs advantages (Manning *et al.*, 2008, Lewin and Couto, 2006; Roza *et al.*, 2011). This relates to cutting labor and resource costs (Roza *et al.*, 2011), but also to access new and important markets (Hutzschenreuter *et al.*, 2011a, Martinez-Noya and Garcia-Canal, 2011). It has also been argued that firms offshore firm activities as part of a resource-seeking strategy, in which particularly qualified personnel is a main driver (Lewin *et al.*, 2009; Javalgi *et al.*, 2009).

Third, research suggests how firm-level heterogeneity such as firm size and past experience drives firms to engage in offshoring (Hutzschenreuter *et al.*, 2011b; Lewin *et al.*, 2009; Roza *et al.*, 2011). For example, there are studies suggesting that firm size has a significant impact on which activities are offshored as well as the motivation for offshoring (Roza *et al.*, 2011). Moreover, firms' past offshoring experience is argued to have an important effect on the degree and success of future offshoring (Hätönen, 2009; Jensen, 2009; Maskell *et al.*, 2007), the types of activities being offshored (Lewin *et al.*, 2009), and the governance modes chosen (Hutzschenreuter *et al.*, 2011a; Martinez-Noya and Garcia-Canal, 2011).

Implementation characteristics

Another offshoring research stream looks more into the characteristics of firms' offshoring implementation, and emphasizes factors such as the governance mode of the implementation, the type of activities being offshored, the locations chosen, and the coordination mechanisms used. First, much research has focused on explaining why firms choose certain governance mode over others (Griffith *et al.*, 2009; Gopal *et al.*, 2003; Hutzschenreuter *et al.*, 2011a; Vivek *et al.*,

2009). For example, using transaction cost economics logic, Griffith *et al.*, (2009) suggest that the asset specificity and uncertainty of the transaction has a direct impact on whether the activity is implemented internally in the firm or in an outsourced arrangement. There is also research analyzing factors that determine the probability of contract renewal in offshore outsourcing arrangements (Manning *et al.*, 2011). Finally, papers have investigated shifts in offshoring governance modes (Vivek *et al.*, 2009; Petersen *et al.*, 2010).

Much attention has also been devoted to understanding why firms choose certain locations when offshoring (Demirbag and Glaister, 2010; Bunyaratavej *et al.*, 2008; Hahn *et al.*, 2011; Fuchs and Kirchain, 2010; Graf and Mudambi, 2005). For example, firms are argued to offshore to locations with favorable wage differentials, knowledge infrastructure, availability of qualified personnel, and preferable country risks relative to the home country (Bunyaratavej *et al.*, 2008; Doh *et al.*, 2009). Research has also investigated how cultural distance impacts the location choice (Hutzschenreuter *et al.*, 2011a). Finally, firms are argued to offshore to locations in which they have previous experience (Demirbag and Glaister, 2010) or ethnic ties (Zaheer *et al.*, 2009).

Further, there is much research investigating which types of tasks are being offshored (Jensen and Pedersen, 2011; Lewin and Peeters, 2006; Maskell *et al.*, 2007). For example, research looks at factors leading firms to offshore services (Jensen and Pedersen, 2011), production (Mudambi and Venzin, 2010), and research and development (Nieto and Rodriguez, 2011). Moreover, over time firms are found to increase the number of activities offshored (Lewin and Peeters, 2006; Manning *et al.*, 2008) as well as the sophistication of the offshored activities (Jensen, 2009; Maskell *et al.*, 2007).

Finally, a stream of research investigates the relationship between offshoring and firms' coordination and integration efforts (e.g., Dibbern *et al.*, 2008; Kumar *et al.*, 2009; Srikanth and Puranam, 2011). For example, Kumar *et al.* (2009) argue that existing interdependency typologies are inadequate in explaining task interdependencies in globally distributed work. Srikanth and Puranam (2011) argue that the new interdependencies that arise between the offshore and onshore tasks negatively impact the performance of the offshored process, and that investing in coordination mechanisms such as modularity, ongoing communication and tacit coordination mechanisms has a positive moderating impact on this relationship.

Performance

There are also a number of research contributions that investigate the outcomes of offshoring. In this respect, different studies have provided different financial and non-financial operationalizations and results on offshoring performance. Research employing financial measures to investigate offshoring performance has looked at aspects such as corporate financial performance (Mol *et al.*, 2005), cost savings (Lewin and Peeters, 2006), export performance (Bertrand, 2011), and sales growth (Murray *et al.*, 1995). Papers employing non-financial measures to investigate offshoring performance has emphasized aspects such as learning and organizational transformation (Jensen, 2009; Maskell *et al.*, 2007), innovation performance (Nieto and Rodríguez, 2011), market shares (Kotabe and Murray, 1990), and implementation time (Hutzschenreuter *et al.*, 2011b).

1.3 THEORETICAL FOUNDATIONS

An organizational design perspective on offshoring

As evidenced by the previous section, extant research has made important contributions in understanding why firms offshore, the characteristics of the offshoring implementation, and the outcomes of offshoring. This thesis seeks particularly to draw and build on the research investigating the organizational design of offshoring (see e.g., Dibbern *et al.*, 2008; Kumar *et al.*, 2009; Srikanth and Puranam, 2011, for similar perspectives regarding the relationship between offshoring and firms' coordination and integration efforts). Specifically, offshoring is regarded as an organizational reconfiguration in which co-located organizational activities are relocated to foreign locations. Whether firms relocate activities with the purpose of accessing resources or as a response to political pressures, this perspective stresses a process in which firms are presented with new challenges of coordinating and integrating offshoring activities in a global organization. The added complexities and uncertainties of coordinating an organization consisting of a number of offshored activities, in contrast to an organization with only co-located activities, require firms to invest additional resources in coordination mechanisms so that an efficient reintegration can be achieved. Thus, offshoring can be described as an organizational reconfiguration in which the relocated activities must subsequently be reintegrated to optimize performance (Mudambi and Venzin, 2010).

To elaborate, organizations can be viewed as systems of interdependent activities that must be coordinated to optimize organizational performance (Lawrence and Lorsch, 1967; Galbraith, 1977; Thompson, 1967). Due to this emphasis on interdependencies, organizations are inherently complex. For example, Thompson (1967) portrays a complex organization as a set of many interdependent parts. Simon (1962: 468) defines complexity in systems as “*a large number*

of parts that interact in a nonsimple way.” The consequences of complexity can be severe unless appropriately managed. For example, since organizational activities require ongoing communication to coordinate decisions and behaviors, a growing number of interdependencies increases the number of channels to coordinate joint and interdependent organizational actions (Thompson, 1967), which in turn affect the organizational ability to process information (Simon, 1955), and eventually increases the likelihood of decision errors (Levinthal, 1997). Moreover, with growing complexity, there is a larger risk of organizational inefficiencies, inertia and lack of response capacity (Anderson, 1999; Moldoveanu and Bauer, 2004; Park and Ungson, 2001; Robson *et al.*, 2008). Thus, a main task for the firm is to manage the complexity and uncertainty inherent in the organization. According to Thompson (1967: 13), “*the central problem for complex organizations is one of coping with uncertainty.*” Firms need to design their organizations so that interdependent work is coordinated and supportive of organizational goals (Van de Ven *et al.*, 1976).

In this respect, firms’ level of architectural knowledge—their understanding of how components in an organizational system are related to each other—is important (Baldwin and Clark, 2000; Brusoni and Prencipe, 2006; Ethiraj and Levinthal 2004a; Henderson and Clark, 1990; Puranam *et al.*, 2012). To make effective design decisions, firms need knowledge about the individual activities and about the ways that the different activities are integrated and linked together in a coherent organizational system. Without knowledge on how the organization with its activities and interdependencies function, the risk that incorrect and even deteriorating design decisions are taken increases.

This view is important when considering offshoring. A major consequence of offshoring is the relocation of originally co-located activities to foreign locations. When activities are co-

located, firms may tend not to see the rationale of formalizing organizational mechanisms for coordination and knowledge transfer through standardized interfaces and clear divisions of labor since day-to-day problems and challenges can more easily be solved in an informal face-to-face manner (Storper and Venables 2004). However, when distinct organizational activities are relocated to foreign locations, firms face increasing complexity and coordination challenges (Kumar *et al.*, 2009; Srikanth and Puranam, 2011). With offshoring, opportunities for informal coordination are reduced (Allen, 1997) and project teams may find it more difficult to build collegial social environments and common ground due to less communication and shared context (Bartlett and Ghoshal, 1989; Clark and Brennan, 1991; Kraut *et al.*, 2002; Martinez and Jarillo, 1989). In contrast to a firm consisting of only co-located activities, a firm that relocates organizational tasks and sub-components abroad must thus coordinate an international network of activities across cultures and different institutional systems (Kumar *et al.*, 2009; Niederman *et al.* 2006; Srikanth and Puranam, 2011). This may prove challenging on a number of dimensions. For example, not only may offshoring provoke internal resistance (e.g., Lewin and Couto, 2007), but it may also hamper operational efficiency due to lack of trust, status differences between domestic and foreign units, and lack of understanding and communication in the process of delivering tasks, and interacting with offshore units (e.g., Vlaar *et al.*, 2008; Levina and Vaast, 2008). Employees with cultural and language differences at geographically dispersed locations are refrained from informal face-to-face coordination, and are forced to rely on less superior technology-based coordination mechanisms (Storper and Venables, 2004). Above all, the dispersion of organizational activities challenges bounded rational decision makers' ability to understand the true interdependency structure underlying various design efforts (cf., Simon, 1955). As firms are required to implement coordination mechanisms that accommodate for the

added distance between interdependent activities, decision makers' need knowledge of how the underlying components in the organizational system are related to each other.

Conceptually, offshoring can therefore be regarded as a three-staged process of organizational reconfiguration that must all be effectively managed to optimize performance: disintegration, relocation, and re-integration (cf., Mudambi and Venzin, 2010). First, offshoring entails that firms dispatch co-located organizational activities. Driven by the potential of economizing the organizational structure by identifying specific tasks to be offshored, firms consequently break down their organizational activities into a larger number of sub-processes. For example, rather than offshoring production as one distinct activity, firms typically offshore activities such as fabrication, assembly, and maintenance. Second, offshoring describes a relocation of the disaggregated business tasks and activities from the home country to a foreign host location so that objectives such as access to lower cost levels, new resources and markets can be achieved. The organization is reconfigured on issues such as the contractual ownership and relationship of the offshoring setup (Hutzschenreuter *et al.*, 2011a), the geography of the host location (Graf and Mudambi, 2005), the interdependencies and coordination mechanisms between the spatially differentiated organizational tasks and activities (Kumar *et al.*, 2009; Srikanth and Puranam, 2011), and the overall coherence of the globally dispersed organizational system (Ernst and Kim, 2002). Third, once the disaggregated activities are relocated, firms need to re-integrate with the remaining organizational activities so that coordinated action may be fulfilled. As such, firms need to ensure that aspects such as knowledge transfer, coordination, and control are not obscured by the geographic, political and institutional distances between the onsite organization and offshoring activities.

1.4 RESEARCH DESIGN

This thesis consists of four distinct research papers that each investigates respective research questions relating to the organizational design and consequences of offshoring. While each paper is written to be self-contained and can be read separately, the intention of the thesis is that the individual contributions together scrutinize the organizational consequences of offshoring and as such provide a coherent answer to the overarching research question. In the following, the empirical foundation of the thesis is elaborated on before the individual research papers are introduced and summarized.

Empirical foundation

The empirical foundation of this thesis resolves around two survey based databases (*Offshoring Research Network* and *Global Operations Network*) and a number of case studies.

Offshoring Research Network

The first database used in this thesis comes from the Offshoring Research Network (ORN). ORN is an international network of firms and scholars studying the emergence of recent trends of services offshoring and outsourcing (see e.g., Lewin and Peeters, 2006; Lewin *et al.*, 2009). Since its foundation in 2004, the ORN research team has primarily conducted two major annual surveys based on which offshoring-related data has been collected: a corporate client survey and a service provider survey. Both the client and provider surveys are taken online, in which respondents reach the survey through external links or e-mail invitations. Once registered and approved by the ORN survey team, respondents are added to the database. The corporate client survey collects data from U.S. firms and European firms on their offshore implementations,

including information on tasks offshored, launch year, location choice, choice of delivery model (both captive and outsourced) and performance data. The service provider survey annually collects a range of firm- and service-specific data from service providers in the U.S., Western and Eastern Europe, India, China, Latin America and other regions. The survey informs about features of services provided, locations from which services are provided, and performance of service delivery. In this thesis, the ORN surveys are used for the papers in Chapter 2 and 4.

Global Operations Network

The second database comes from the Global Operations Network (GONe); a research network of different Scandinavian universities² established in 2009 that study industries and companies that been intensively exposed to globalization. Among other activities, the network has conducted a survey among firms from Denmark and Sweden that focuses on the process of relocating activities to foreign locations (targeting the latest offshoring implementation in the respective firms). Assuming that the process of offshoring challenges firms' ability to coordinate a globally concerted organization (Kumar *et al.*, 2009; Srikanth and Puranam, 2011), the purpose of this survey is to unravel the organizational consequences of offshoring on issues such as different organizational mechanisms that firms employ to manage their offshoring activities as well as to investigate performance implications and capability development. The population of the study consists of all Danish firms across industries with more than 50 employees (2,908 companies) and all Swedish manufacturing firms with more than 50 employees (1,549 companies). The survey was conducted among these 4,457 companies in the time period from September 2011 to January 2012, where the CEOs of the companies were invited to participate in an online survey

² Aalborg University, Chalmers University of Technology, Copenhagen Business School, and University of Southern Denmark.

per postal mail and e-mail. In the survey, the respondents were asked about the characteristics of the offshoring implementations, the coordination of the offshoring activities, the interdependencies between domestic and offshored activities, and the effects of offshoring the activities. All in all, 1,086 usable questionnaires were received, which represents a response rate of 24.4%. Out of these, 379 companies (34.9%) reported that they have experience with offshoring. This data is used in Chapter 3.

Case studies

Finally, a number of case studies on the offshoring experiences of Danish companies have been conducted (see e.g., Larsen *et al.*, 2010; Larsen and Pedersen, 2012a; Larsen and Pedersen, 2012b, for teaching cases). A recurring theme in the case studies is the evolution of offshoring practices within the firms. For example, a case study of LEGO (Larsen *et al.*, 2010) describes the evolution of the company's offshoring practice over a period of seven years, and stresses how complexity and uncertainty led to significant reconfiguration efforts. The data for the cases consists of a number of in-depth semi-structured interviews with respective managers in the companies and rich secondary data such as annual reports and industry descriptions. Although the cases do not form the empirical backbone of the thesis, Chapter 4 draws explicitly on a case study of Nokia with the purpose of building theory, and Chapter 5 uses the LEGO case as an example to illustrate theory. In general, though, the purpose of the case studies is to understand the broader organizational impact of offshoring in a narrative form.

Summary of the research papers

While the four research papers deviate in their focus, a common thread relates to the notion that offshoring signifies an organizational reconfiguration with consequences for areas such as decision-making, architectural knowledge, and performance. The first paper investigates how the organizational complexity of offshoring leads to ‘hidden costs’ of reconfiguring the organization, i.e., deviations between expected and realized costs of implementing activities abroad. The second paper looks at how these hidden reconfiguration costs influence the process performance of the offshored activity, and how this relationship is moderated by the modularity of that activity. The third paper investigates the effect of the organizational reconfiguration of offshoring on firms’ strategies. The final paper studies performance implications of how firms adapt when offshoring. The four papers are summarized in Table 1.2 and are elaborated on in the following.

Chapter 2: Uncovering the hidden costs of offshoring: The interplay of complexity, organizational design, and experience (co-authored with Stephan Manning and Torben Pedersen)

The first research paper studies hidden costs of implementing offshoring activities abroad (e.g., Dibbern *et al.*, 2008; Stringfellow *et al.*, 2008). A key function in strategic decision-making is the ability to estimate the costs of implementing strategic decisions (Durand, 2003; Makadok and Walker, 2000). It is argued that certain costs of implementation are neglected in strategic decision-making processes, and as such can be regarded as hidden. Since offshoring is seen as an organizational reconfiguration in which originally co-located activities are relocated across distances in captive or outsourced arrangements, the challenges of coordinating and integrating

offshoring activities in globally organized firms make the efficient ex ante estimation of future costs more difficult. Specifically, the growing configuration and task complexity of offshoring has a negative impact on decision makers' ability to estimate the future costs of offshoring, resulting in cost estimation errors. However, it is also argued that the organizational design orientations of firms' offshoring strategies and offshoring experience have a positive moderating role on the relationship between complexity and cost estimation errors. Firms with strategies characterized by a strong orientation toward an overall system of structures and processes and with prior experience are more likely to anticipate and align offshoring complexity with corresponding organizational structures and processes, and thus reduce the negative impact of complexity.

These arguments are supported by comprehensive data from the Offshoring Research Network. However, the data also suggest that while captive offshoring is much more responsive to broader configuration and design factors, hidden costs in offshore outsourcing are more driven by task- and transaction-related factors. In sum, these findings have important implications for ongoing research on hidden costs of globally dispersed and complex operations (e.g., Kumar *et al.*, 2009; Srikanth and Puranam, 2011) and for research on estimation biases in strategic decision-making (e.g., Durand, 2003; Hogarth and Makridakis, 1981; Kahneman and Lovallo, 1993; Makadok and Walker, 2000; March and Simon, 1958).

Table 1.2 – Overview of research papers

	<i>Chapter 2</i>	<i>Chapter 3</i>	<i>Chapter 4</i>	<i>Chapter 5</i>
<i>Title (co-authors)</i>	“Uncovering the hidden costs of offshoring: The interplay of complexity, organizational design, and experience” (with Stephan Manning and Torben Pedersen).	“Foreseeing reconfiguration costs and the role of modularity: A study on offshoring process offshoring” (single-authored).	“Organizational reconfiguration and strategic response: The case of offshoring” (with Torben Pedersen).	“Organizational adaptation in offshoring: The difference between an experimental and experiential learning strategy” (with Christian G. Asmussen and Torben Pedersen).
<i>Research question</i>	What are factors that cause hidden costs and why do some firms encounter higher hidden costs than others?	What are performance implications of reconfiguration cost estimation errors?	How does the organizational reconfiguration of offshoring influence firms’ strategies?	What is the difference between an experimental and experiential learning strategy when offshoring?
<i>Methods</i>	Quantitative using data from the <i>ORN</i> .	Quantitative using data from the <i>GONe</i> .	Qualitative case on Nokia Denmark and quantitative using data from the <i>ORN</i> .	Formal modeling of organizational adaptation.
<i>Findings</i>	Offshoring complexity is positively associated with cost estimation errors, while design orientation and experience negatively moderate this effect.	Reconfiguration costs estimation errors negatively impact process performance consequences, while modularity positively influence this effect	As firms’ offshoring increases, they will growingly acknowledge organizational objectives in their strategies.	The attractiveness of an experiential strategy decreases with distance and coordination costs but increases with the uncertainty of the underlying technological landscape.

Chapter 3: Foreseeing reconfiguration costs and the role of modularity: A study on offshoring process offshoring (single-authored)

Following up on the first research paper, this second research paper investigates performance implications of hidden costs, i.e., the situations where decision makers' estimations of the reconfiguration costs of implementing strategic decisions are surpassed by actual cost levels. Embedded in literature that investigates the relationship between firms' estimation ability and performance (Durand, 2003; Eisenhardt and Martin, 2000; Makadok and Walker 2000), it is argued that decision makers' inability to effectively estimate the reconfiguration costs of implementing an activity in a foreign location has a negative impact on the process performance of that activity. As firms underestimate reconfiguration costs, they incur substantial opportunity costs by allocating and investing unexpected additional resources in personnel training, facilities, and materials which may eventually result in economic and cognitive barriers (Lavie, 2006). Consequently, reconfiguration cost estimation errors will likely make the operations of the activity less prioritized, and this will have a negative impact on the process performance of that activity.

However, it is further argued that this relationship is positively moderated by the modularity of the activity. Building the argument developed in the first research paper that the complexity of coordinating an offshoring organization lead to cost estimation failures, the extent to which the activities that are relocated offshore are modularized—i.e., the interdependencies specified and standardized (Baldwin and Clark, 2000; Sanchez and Mahoney 1996)—should positively moderate the negative relationship between cost estimation errors and process performance. By more easily facilitating aspects such as organizational reintegration, knowledge

transfer, and effective division of labor between the domestic and foreign activities, the negative impact of reconfiguration cost estimation errors is undermined.

These arguments are supported by comprehensive data on 221 offshoring implementations from the GONe survey, and contribute to ongoing research on offshoring by emphasizing the importance of reconfiguration costs estimation in the offshoring processes (e.g., Lewin and Peeters, 2006; Mol *et al.* 2005; Massini *et al.*, 2010). Moreover, this paper contributes more generally to research on hidden costs and firms' estimation ability (Durand, 2003; Makadok and Walker, 2000; Stringfellow, *et al.*, 2008) by emphasizing the importance of estimating the costs of internal organizational change (cf., Karim and Mitchell, 2004) while at the same time aligning firms' coordination mechanisms to the new organizational requirements.

Chapter 4: Organizational reconfiguration and strategic response: The case of offshoring (co-authored with Torben Pedersen)

The third research paper investigates the effect of the organizational reconfiguration of offshoring on firms' strategies. When firms reconfigure their organizations, they need knowledge on how different activities are integrated and linked together in a coherent organizational system (Brusoni and Prencipe, 2001; 2006; Henderson and Clark, 1990; Puranam *et al.*, 2012). Since a consequence of relocating activities to foreign locations is the need to reintegrate the geographically relocated organizational activities into a coherent organizational architecture (Mudambi and Venzin, 2009), firms thus need architectural knowledge. In this respect, cumulative learning-by-doing over time is important (Nelson and Winter, 1982; Adler and Clark, 1991). As firms gain experience with the offshoring implementation, decision makers will increasingly understand the true nature of the organizational activities and the interdependencies

between these and as such accumulate architectural knowledge. Consequently, as firms' experience with particular offshoring implementations increases they will begin to consider organizational objectives in their strategies.

This idea is developed using a mixed-method approach based on a qualitative case study of Nokia, one of the worlds' largest mobile phone manufacturers, and data from the ORN survey. First, the findings of an in-depth case study of offshoring in a product development project in Nokia are presented. The case shows how the decision to offshore was initially driven by locational objectives, such as lower costs and access to strategic resources, but that this changed over time towards organizational objectives that could increase organizational performance. Second, ORN data suggest that firms with more experience with a specific offshoring project is more likely to encapsulate objectives such as enhancing efficiency through business process redesign and reduced system redundancy in their strategies. These findings contribute to research on the role of architectural knowledge in offshoring and more broadly to literature that seeks to understand how different architectural forms and practices correlate to organizational performance (e.g., Datta, 1991, Foss *et al.*, 2011, Zott and Amit, 2008, Sah and Stiglitz, 1986).

Chapter 5: Organizational adaptation in offshoring: The difference between an experimental and experiential learning strategy (co-authored with Christian Geisler Asmussen and Torben Pedersen)

The final paper builds on the third research paper, but argues that architectural knowledge accumulation is not necessarily always a result of cumulative learning-by-doing over long periods of time. In contrast, firms can pursue an experimental learning strategy in which they seek to accumulate architectural knowledge before the actual offshoring relocation takes place.

Here, firms can accumulate architectural knowledge by experimenting with different configurations while the activities are still co-located at home.

By juxtaposing the experiential learning strategy (learning-by-doing after offshoring implementation) and the experimental learning strategy (home-based learning before offshoring implementation), this paper builds a formal model that examines the performance implications of how firms adapt to an underlying technological landscape through the accumulation of architectural knowledge in the context of offshoring. In contrast to other perspectives on the organizational change and adaptation (Brusoni and Prencipe, 2006; Eisenhardt and Brown, 1999; Ethiraj and Levinthal, 2004a; Karim, 2006; 2009; Zhou, 2011), the context of offshoring has the benefit of adding the element of distance to the interdependent organizational system (Kumar *et al.*, 2009; Niederman *et al.* 2006; Srikanth and Puranam, 2011). It is argued that the relative attractiveness of the experiential strategy decreases with distance and coordination costs but increases with the uncertainty of the underlying technological landscape. Uncertainty creates noise that makes it increasingly difficult for firms to estimate the impact and consequences of the organizational reconfiguration. Moreover, it is argued that uncertainty has a positive moderating effect on the relationship between distance and the experiential strategy. Uncertainty signifies a lower signal-to-noise ratio which leads to situations of causal ambiguity (Lippman and Rumelt, 1982), and the value of accumulating architectural knowledge through the experimental learning strategy is undermined.

This paper contributes to research on architectural knowledge (Ethiraj and Levinthal 2004a; Henderson and Clark, 1990) by proposing a performance trade-off between the experimental and experiential learning strategy. Moreover, by stressing the performance implications of how firms gain architectural knowledge when going abroad, this paper extends

existing views on internationalization that emphasize how firms need to accumulate local market knowledge to adapt to new foreign environments (Johanson and Vahlne, 1977; Lord and Ranft, 2000; Makino and Delios, 1996).

1.5 FINAL REMARKS

This thesis investigates offshoring in an organizational context. Adapting the view that offshoring signifies an organizational reconfiguration, this thesis seeks to understand how the organization is affected by the decision to relocate firm activities to foreign locations. In so doing, it intends to understand why some firms fail when offshoring and others do not. The four research papers constituting this thesis are presented in the following chapters. In the final chapter, the thesis is concluded by discussing its implications.

Chapter 2

Uncovering the hidden costs of offshoring: The interplay of complexity, organizational design, and experience¹

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Stephan Manning³

Torben Pedersen⁴

Abstract: This study investigates estimation errors due to hidden costs—the costs of implementation that are neglected in strategic decision-making processes—in the context of services offshoring. Based on data from the Offshoring Research Network, we find that decision makers are more likely to make cost-estimation errors given increasing configuration and task complexity in captive offshoring and offshore outsourcing, respectively. Moreover, we show that experience and a strong orientation toward organizational design in the offshoring strategy reduce the cost-estimation errors that follow from complexity. Our findings contribute to research on the effectiveness of sourcing and global strategies by stressing the importance of organizational design and experience in dealing with increasing complexity.

Keywords: hidden costs; offshoring; complexity; estimation errors; organizational design.

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2.1 INTRODUCTION

Many firms find that the implementation of strategic decisions can trigger substantial hidden costs that negatively affect firm performance. For example, a firm may find that the implementation of a diversification strategy requires substantially more coordination than initially expected. A firm may also discover that knowledge transfer in the context of internationalizing business activities is more costly than expected. By hidden costs, we refer to the unanticipated costs of implementation that arise in strategic decision-making processes (see Dibbern *et al.*, 2008; Reitzig and Wagner, 2010; Stringfellow *et al.*, 2008). In this paper, we investigate the nature of estimation errors due to hidden costs. In particular, we seek to better understand why certain costs are hidden from managerial attention and thus not accounted for in initial cost estimations.

We study hidden costs in the context of offshoring of administrative and technical services, that is, the sourcing of business services supporting domestic and global operations from abroad in internal or external arrangements (Contractor *et al.*, 2010; Manning *et al.*, 2008). The offshoring of service activities has gained momentum in recent years. Today, many western firms not only offshore standardized IT and business processes but also more complex, knowledge-intensive activities and product development (Lewin *et al.*, 2009). However, many firms have begun to realize that managing an increasingly globally dispersed organization is more difficult and costly than initially expected (Dibbern *et al.*, 2008; Stringfellow *et al.*, 2008). In particular, decision makers often fail to accurately estimate the costs of offshoring and are therefore surprised by unexpected—or hidden—costs of implementing offshoring decisions.

Most research on offshoring to date has focused on why firms offshore particular functions, the governance modes they choose, the locations they select to host offshored

activities, and the outcomes that they achieve (e.g., Lewin *et al.*, 2009; Kedia and Mukherjee, 2009; Mol *et al.*, 2005). In this paper, we focus on the organizational design of offshoring, and the challenge of coordinating and integrating offshoring activities in globally organized firms (Srikanth and Puranam, 2011). In this regard, offshoring can be described as an organizational reconfiguration in which originally co-located activities are relocated across distances in captive or outsourced arrangements, which must subsequently be reintegrated (Mudambi and Venzin, 2010). Consequently, firms are often presented with new complexities and uncertainties, which have an impact on decision makers' abilities to estimate the costs of offshoring.

Using comprehensive data from the Offshoring Research Network, we argue that the increased complexity that follows from offshoring involves a number of operational challenges and related costs, part of which are ignored or not anticipated when offshoring decisions are made. As a result, we observe a significant gap between expected and achieved performance, as measured by the distance between expected and achieved cost savings. However, we also argue that this relationship is moderated by the organizational design orientations of firms' offshoring strategies and by firms' offshoring experience. Firms with strategies characterized by a strong orientation toward an overall system of structures and processes, and firms with prior experience are more likely to anticipate and align offshoring complexity with corresponding organizational structures and processes. Thus, organizational design orientation and experience nurture decision makers' abilities to anticipate the costs of complex organizations.

Our findings contribute to the growing stream of literature on the operational challenges of offshoring (Srikanth and Puranam, 2011; Stringfellow *et al.*, 2008) by emphasizing the importance of hidden costs, complexity, design strategies, and experience. On a more general level, these findings have important implications for estimation biases in strategic decision

making, and improve our understanding of the role of experience and organizational design orientation in relation to those biases (e.g., Durand, 2003; Hogarth and Makridakis, 1981; Kahneman and Lovallo, 1993; Makadok and Walker, 2000; March and Simon, 1958). This research emphasizes the organizational design of a firm and highlights how organizational changes should be incorporated into strategic analyses. This may stimulate future research on the evolution of global firm designs and architectures by stressing the role, magnitude, and consequences of complexity in organizations (e.g., Ethiraj and Levinthal, 2004a; Nadler and Tushman, 1997; Sinha and Van de Ven, 2005).

2.2 THEORY AND HYPOTHESES DEVELOPMENT

Hidden costs, complexity, and bounded rationality

Hidden costs can be understood as implementation costs that are not anticipated in the various stages of strategic decision making. A key function in strategic decision making—defined as the commitment to important decisions in terms of actions to be taken, resources to be devoted, or precedents set (Dean and Sharfman, 1996; Eisenhardt and Zbaracki, 1992; Mintzberg, Raisinghani, and Théorêt, 1976)—is the ability to estimate the costs of implementing a strategic decision (Durand, 2003; Makadok and Walker, 2000). Often, however, firms find that unanticipated costs or ‘post-decision surprises’ (Harrison and March, 1984) erupt and challenge the strategic intent and rationale of the decision. In such cases, these costs have been ignored or overlooked—thus hidden—by the decision maker in the strategic decision-making process. Hidden costs are thus *ex ante* unaccounted for, which is why they materialize *ex post* as a discrepancy between expected and realized costs.

A direct consequence of hidden costs is a negative effect on a decision maker's ability to estimate the impact of strategic decisions, as important costs are hidden from managerial attention. Previous research has emphasized that individual biases may impact decision makers' estimation abilities (e.g., Kahneman and Tversky, 1984; Das and Teng, 1999), that routines may short-circuit individuals' autonomous judgments (Nelson and Winter, 1982), and that dominant logic may result in blind spots in decision making (Prahalad and Bettis, 1986). In this paper, however, we focus on the role of the organizational context in decision makers' estimation abilities (e.g., Durand, 2003; Hogarth and Makridakis, 1981; March and Simon, 1958) and, in particular, on how organizational complexity influences decision makers' abilities to account for costs of implementation. Thus, we seek to understand the impact of complexity on the ability of firms to anticipate the actual costs of a strategic implementation. In this regard, we are able to explain how decision makers systematically ignore or overlook important costs in strategic decision-making processes.

The organizational impacts and consequences of complexity have long been part of the research tradition (Langlois and Robertson, 1992; Loasby, 1976; Nickerson and Zenger, 2002; Rawley, 2010; Simon, 1962; Williamson, 1975). Simon (1962: 468) defines complexity in systems as "*a large number of parts that interact in a nonsimple way.*" If organizations are viewed as networks of tasks (Grandori 2001; Thompson 1967), then complexity exists when a large number of tasks are interdependent. For example, an organization is complex if change in one unit requires change in many other units. Moreover, a growing number of interdependent parts in an organization increases combinatorial complexity, as the addition of one element results in an exponential increase in the number of possible interfaces and interdependencies (Ethiraj and Levinthal, 2004a).

A firm's complexity can affect its decision making in many ways. For example, a firm that decides to disaggregate its organization into a number of smaller, semiautonomous units will experience a rise in the total number of interfaces within the organizational system. As organizational tasks and activities require ongoing communication to coordinate decisions and behaviors, interdependencies arise along with a growing number of channels to coordinate joint and interdependent organizational actions (Thompson, 1967). This has consequences for information-processing demand (Simon, 1955), which, in turn, increases the likelihood of decision errors (Levinthal, 1997). As such, increasing complexity progressively creates difficulties for decision makers attempting to grasp and anticipate the effects of emerging interdependencies on system behavior and performance (Ethiraj and Levinthal, 2004a; Zhou, 2011). Complexity limits the ability of managers to rationally account for all important decision factors (March and Simon, 1958), which increases the risk that certain performance-detrimental consequences will remain hidden in the strategic decision-making process. Hidden costs, therefore, relate to implementation costs that are hidden from managerial attention at the point of strategic decision making (see Ocasio, 1997).

The hidden costs of offshoring

We investigate hidden costs in the context of services offshoring. Offshoring refers to the internal and external sourcing of tasks and services from a location outside the home country in support of domestic and global operations (Contractor *et al.*, 2010; Manning *et al.*, 2008). Many offshored activities are interlinked with domestic processes and often require complex coordination (Srikanth and Puranam, 2011). This setting is therefore suitable for investigating the interplay between complexity and hidden costs.

A substantial body of research has demonstrated that offshoring decisions are driven by a number of factors, including expectations of lower labor and production costs (Dossani and Kenney, 2003), access to talent and qualified labor (Lewin *et al.*, 2009), and opportunities to learn (Jensen, 2009). At the same time, however, there are also indications that the initial objectives of offshoring are not always achieved and that offshoring decisions may eventually prove more costly than expected (Dibbern *et al.*, 2008; Massini *et al.*, 2010; Stringfellow *et al.*, 2008). For instance, the multinational information technology (IT) corporation Dell Inc. decided to back-source its Indian service centers after encountering unexpected challenges of cultural and geographic distance (Frauenheim, 2003).

The concept of hidden costs can be related to three streams of offshoring research (see Table 2.1). The first stream focuses on the impact of hidden costs on the financial value of offshore outsourcing (e.g., Barthélemy, 2001; Overby, 2003)—a question of interest to business practitioners, in particular. In emphasizing the challenges of offshoring, these practitioner-oriented articles have attempted to specify and quantify the hidden financial costs of offshoring.

The second stream discusses hidden costs in relation to strategic choices between international outsourcing and vertical integration, where outsourcing—and the resulting loss of control and transaction costs resulting from the shift of ownership to an external partner—might erode firms' capabilities and resources (e.g., Bettis *et al.*, 1992; Hendry, 1995; Reitzig and Wagner, 2010). For example, Stringfellow *et al.* (2008: 166) label “*invisible costs in offshoring services work*” as “*hidden communication-related costs associated with the use of foreign service providers.*” Reitzig and Wagner (2010) argue that hidden outsourcing costs can disrupt incremental in-house learning processes. Dibbern *et al.* (2008: 333) identify four particular types of unexpected ‘extra costs’ arising from outsourcing software projects to third-party providers

abroad: “1) requirements specification and design, 2) knowledge transfer, 3) control, and 4) coordination.”

Table 2.1 – Three streams of research on the hidden costs of offshoring

Theoretical focus	Research question	Examples/consequences of hidden costs	Indicative literature
Performance indicator	How might the practice of offshoring eventually undermine anticipated financial value?	<ul style="list-style-type: none"> • Costs of selecting a vendor • Costs of layoffs • Cultural costs • Ramp-up costs • Costs of managing an offshore contract 	<ul style="list-style-type: none"> • Barthélemy (2001) • Overby (2003)
Noncontractual costs	How does international outsourcing (in contrast to vertical integration) create unexpected costs for firms?	<ul style="list-style-type: none"> • Reduce learning capabilities • Reduce robustness • Reduce long-term responsiveness • Reduce coordination ability • Undermine core competences 	<ul style="list-style-type: none"> • Bettis <i>et al.</i> (1992) • Hendry (1995) • Reitzig and Wagner (2010)
Costs of reconfiguration and relocation	How does the global relocation and reconfiguration of business tasks and activities create unexpected costs for firms?	<ul style="list-style-type: none"> • Coordination costs • Design/specification costs • Control costs • Knowledge transfer costs 	<ul style="list-style-type: none"> • Dibbern <i>et al.</i> (2008) • Kumar <i>et al.</i> (2009) • Stringfellow <i>et al.</i> (2008) • Srikanth and Puranam (2011)

A third and more recent stream focuses more fundamentally on hidden costs associated with relocating and redesigning tasks and processes within an orchestrated value-generating system; that is, the costs of reconfiguring a firm's internal and external value chains (e.g., Kumar *et al.*, 2009; Levy, 1995; Srikanth and Puranam, 2011). According to this view, offshoring can be regarded as the process of reconfiguring value chain activities across dispersed locations regardless of whether outsourcing or an internal delivery model is chosen (Contractor *et al.*, 2010; Manning *et al.*, 2008). Therefore, hidden costs might arise from unanticipated organizational needs, and can be related to areas such as knowledge transfer, new interdependencies, training and coaching, the protection of intellectual capital, or the monitoring of performance of offshore units.

In this study, we address all three research streams, but we focus in particular on the third stream by examining why certain costs of reconfiguring a firm's value chain in the implementation of both captive offshoring and offshore outsourcing are hidden from managerial attention in decision-making processes and thus not accounted for in initial cost estimations. Obviously, the offshoring of services might also encapsulate hidden benefits, such as unanticipated advantages of relocating tasks and activities abroad. For instance, the well-known 'went for price, stayed for quality' reference (Dossani and Kenney, 2003) captures a situation in which firms encounter 'positive externalities' of offshoring. In other words, firms may find that certain outcomes, such as higher service quality, exceed initially expected benefits, such as lower labor costs. However, in this paper we focus on a setting in which the practice of offshoring typically undermines initial objectives.

The complexity of offshoring

We propose that cost-estimation errors as a manifestation of hidden costs can be explained by increasing offshoring complexity. In contrast to a company undertaking all of or the majority of its activities at home in proximity to its headquarters, a firm sourcing a large number of activities from multiple internal and external providers in different countries is likely to face higher complexity. In the following, we distinguish between two types of complexity in offshoring that challenge decision makers' estimation abilities: configuration complexity and task complexity.

Configuration complexity refers to complexity in terms of the interdependencies in the organizational configuration. In this regard, we distinguish between the structural, operational, and social layers of the organizational configuration, which together challenge decision makers' cost-estimation abilities. First, structural complexity arises because new interdependencies emerge between functional units and across country borders as a consequence of offshoring. For instance, when an organizational subtask is relocated to a foreign location, its interdependencies with other organizational units are obscured by geographic, political, and institutional differences (Kumar *et al.*, 2009). Similarly, prior research finds that extensive outsourcing of manufacturing creates new interdependencies, which increase the likelihood of delays and disruptions in global supply chains (e.g., Levy, 1995).

Second, research suggests that the process of offshoring presents companies with a higher number of tasks and activities (Contractor *et al.*, 2010; Mudambi and Venzin, 2010), thus increasing operational complexity. Driven by the potential to lower costs and increase efficiency by identifying specific tasks to be offshored, firms break down and 'fine slice' value chain activities into a larger number of sub-processes. For example, while research and development (R&D) might constitute one distinct, integrated value chain activity in a home country context,

firms might choose to disaggregate the function into a number of more narrowly defined tasks and activities when subjecting them to captive and outsourced offshoring. As a result, firms face a higher number of interdependencies among processes and, hence, increased operational complexity.

Third, we argue that the two types of complexity identified above relate to a third type, which we call social complexity. Recent research indicates that offshoring may not only provoke internal resistance (Lewin and Couto, 2007) but also hamper operational efficiency due to a lack of trust, status differences between onsite and offshore units, and a lack of understanding and communication in the process of delivering tasks and interacting with offshore units (Vlaar *et al.*, 2008; Levina and Vaast, 2008). A lack of face-to-face interaction, as well as cultural and language differences among employees at geographically dispersed locations, may increase social complexity given the need for ‘non-simple’ practices of relationship-building between employees and teams.

Task complexity, in contrast, relates to the complexity of the individual offshoring implementations (e.g., Mudambi and Tallman, 2010; Kumar et al., 2009). A number of different task characteristics can influence the complexity of an offshoring implementation, including the task’s degree of standardized versus tacit knowledge flows; the presence of inexact and unknown means-ends connections; the number and interdependence of subtasks; and the existence of path-goal multiplicity (e.g., Campbell, 1988; Wood, 1986). In comparison with simpler tasks for which such aspects as input and output requirements are easily defined, complex tasks with imprecise and ambiguous requirements are more likely to subject the decision maker to bounded rationality and uncertainty in the decision-making process. Indeed, research suggests that firms are increasingly offshoring more complex tasks, such as design, engineering, and analytical

services (Lewin *et al.*, 2009). Accordingly, we argue that the task complexity of different offshoring implementations can challenge decision makers' abilities to estimate the costs of relocating a service activity abroad.

In sum, we define offshoring complexity as a combination of configuration and task complexity. While task complexity resides within the actual implementation, configuration complexity occurs as a result of new interdependencies between countries, activities, and people. In line with research on complexity (e.g., Anderson, 1999; Ethiraj and Levinthal, 2004a; Rawley, 2010), we argue that a higher degree of offshoring complexity makes it difficult for decision makers to consider all important decision-making factors, especially the overarching organizational system and its effect on organizational behavior and performance, prior to an offshoring implementation. In particular, complexity has consequences for decision makers' cost-estimation abilities, as the managerial task of understanding the globally reconfigured organization becomes complicated and is more likely to be misguided, thus resulting in costs that are hidden from the decision makers' view. Therefore, there is a greater risk that decision makers facing a high degree of offshoring complexity will make cost-estimation errors in the decision-making process. Accordingly:

***Hypothesis 1:** A higher degree of offshoring complexity is likely to increase cost-estimation errors.*

The moderating effect of organizational design orientation and experience

A number of recent studies report that many firms experience improved performance as a result of offshoring, despite high complexity (e.g., Lewin *et al.*, 2009; Massini *et al.*, 2010). For

instance, firms taking a more strategic approach to offshoring, such as those adopting consistent ways of selecting locations, implementing projects, and coordinating operations, report better performance (Massini *et al.*, 2010). Thus, we posit that the hypothesized relationship between offshoring complexity and cost-estimation errors is moderated by factors that explain why some firms are comparatively better than others in accounting for hidden costs of offshoring in the strategic decision-making process. In the following, we argue that firms' organizational design orientation and offshoring experience help decision makers to better estimate costs as offshoring complexity increases.

Hidden costs become more likely as the complexity of an organizational system increases. This makes it difficult for decision makers to direct appropriate attention during the decision-making process to future changes in organizational structures and the interdependencies that may result from offshoring. In this respect, the congruence between different components in an organizational system spread across different locations becomes central (Nadler and Tushman, 1997; Russo and Harrison, 2005). Organizational congruence is defined as "*the degree to which the needs, demands, goals, objectives, and/or structures of one component are consistent with those of the other*" (Nadler and Tushman, 1997: 34). While typical models of fit look at dyadic relationships, such as the fit between strategy and structure (Chandler, 1962), the congruence model is based on the assumption that fit can be multifaceted, simultaneously encapsulating different organizational dimensions. Accordingly, we use the congruence model to portray the fit between globally dispersed organizational processes, activities, and people, that is, the degree to which structures and interdependencies across and within organizational boundaries remain consistent as offshoring complexity grows. High congruence corresponds to high consistency in the organizational system encapsulating the functional units and human

resources spanning national borders and the interdependencies among them. Similarly, a low degree of congruence corresponds to low consistency in the organizational system.

The degree to which organizational congruence is reflected in a firm's offshoring strategy is important for how accurately decision makers estimate the consequences of offshoring complexity. A dominant perception has been that a firm's primary objective when offshoring is to reduce labor costs by targeting low-wage sourcing destinations, such as China and India, and to access qualified personnel and new markets (Dossani and Kenney, 2003; Kedia and Lahiri, 2007). However, research suggests that offshoring may also be motivated by the opportunity to improve a firm's organizational system (Lewin and Couto, 2007). For example, a number of firms view the potential for increased organizational flexibility, business process reengineering, and reduced system redundancy as an important driver of offshoring. Moreover, firms with corporate-wide offshoring strategies report a range of offshoring outcomes besides reduced costs, such as organizational flexibility (Massini *et al.*, 2010).

We therefore argue that offshoring strategies involving a strong orientation toward the overall system of structures and processes, rather than the mere relocation of particular tasks for resource-seeking reasons, are better able to account for the hidden costs that follow from increasing offshoring complexity, as managerial attention is directed toward how the organization and its interdependencies are affected by the offshoring decision (Ocasio, 1997). In such situations, decision makers can match the impact of the anticipated organizational changes caused by offshoring with resource allocations so that the main offshoring objectives can be met. Thus, a higher degree of orientation toward the organizational design of offshoring promotes the decision maker's ability to align offshoring complexity with corresponding organizational

structures and processes, and consequently negatively moderates the positive relationship between complexity and cost-estimation errors. Hence:

***Hypothesis 2:** The positive association between offshoring complexity and cost-estimation errors is negatively moderated by firms' strategic orientation toward organizational design.*

A necessary prerequisite for recognizing the most efficient mechanisms for managing complex organizations is extensive organizational system knowledge. Organizational system knowledge can be defined as knowledge about individual organizational activities comprising an organizational system and about how those activities are integrated into an orchestrated organizational system (Brusoni and Prencipe, 2006; Henderson and Clark, 1990). In order to make effective decisions based on expectations of how the organization is going to change, decision makers need knowledge about individual activities and about the ways in which different activities are integrated and linked together in a coherent organizational system. For example, Brusoni and Prencipe (2006) argue that knowledge evolution is a strong and important mediator in organizational change. Similarly, Haunschild and Sullivan (2002) suggest that complex and heterogeneous circumstances spur positive learning in organizations. Accordingly, firms' abilities to estimate the consequences of the complexity of offshoring are affected by their organizational system knowledge, including knowledge of interdependencies and interfaces between different units and activities.

Thus, a central question is the following: how do firms acquire and accumulate knowledge to successfully integrate a vast array of heterogeneous activities into an orchestrated

system? In this respect, offshoring is often portrayed as a learning-by-doing process (Jensen, 2009; Maskell *et al.*, 2007). In particular, research shows that firms with previous offshoring experience generally display better performance in new offshoring ventures (Hutzschenreuter *et al.*, 2007; Manning *et al.*, 2008). Hutzschenreuter *et al.* (2007) argue that firms' past offshoring experience may influence the range of issues and possibilities that managers consider when making offshoring decisions. Thus, we argue that firms with prior offshoring experience are more likely to have accumulated organizational system knowledge and will therefore be comparatively better in estimating the costs of offshoring associated with complexity. In other words, firms with experience are more likely to anticipate the hidden costs of offshoring and therefore avoid estimation errors. We therefore hypothesize the following:

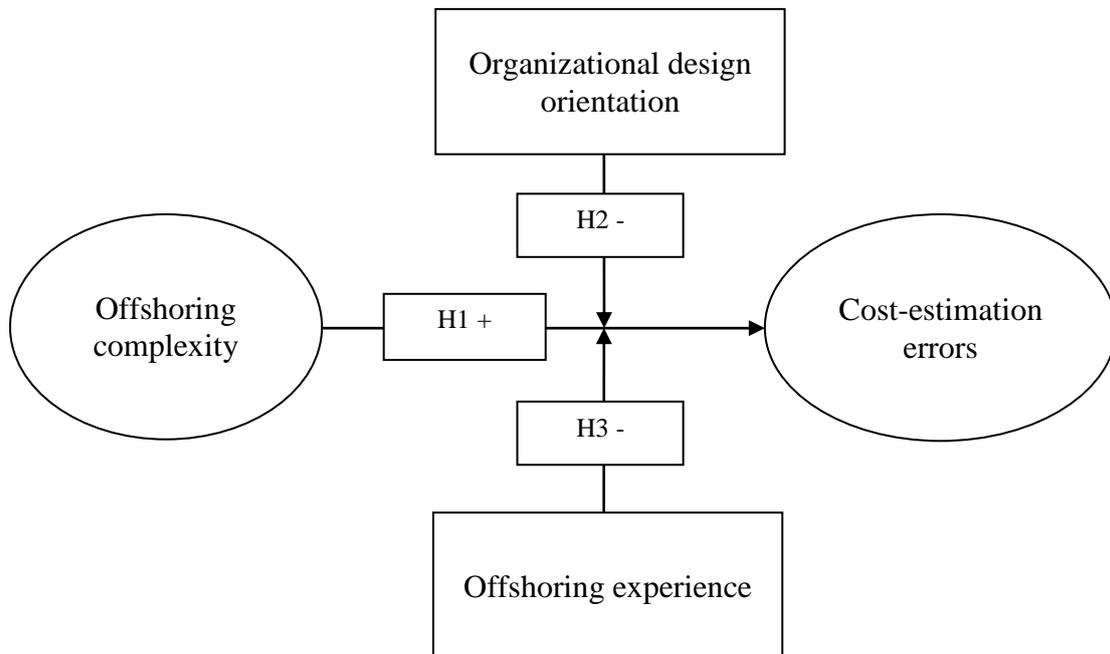
***Hypothesis 3:** The positive association between offshoring complexity and cost-estimation errors is negatively moderated by the firms' offshoring experience.*

In sum, we derive a theoretical model of hidden costs in which offshoring complexity is likely to increase cost-estimation errors but is negatively moderated by organizational design orientation and experience (see Figure 2.1).

2.3 DATA AND METHODS

We examine both the effect of offshoring complexity on cost-estimation errors as a manifestation of hidden costs, and the moderating effects of design orientation and offshoring experience of the firm using primary data collected by the Offshoring Research Network (ORN) and data gathered from secondary sources (on distances). The ORN is a network of scholars and organizations

Figure 2.1 – Theoretical model: the hidden costs of offshoring



based in the United States, Europe, and Australia that study the emergence of trends in services offshoring (e.g., Lewin *et al.*, 2009; Massini *et al.*, 2010; Manning *et al.*, 2011). Since its foundation in 2004, the ORN research team has conducted two major surveys annually—a corporate client survey and a service provider survey—to collect offshoring-related data. As both the client and provider surveys are taken online, respondents reach the survey Web site through external links or e-mail invitations. Once registered and approved by the ORN survey team, respondents are added to the database. The fact that both surveys are utilized for this study, in combination with other secondary sources, helps us address the common method variance problem (Chang *et al.*, 2010).

The corporate client survey collects data from U.S. firms (since 2004) and European firms (since 2006) on their offshoring strategies, drivers, concerns, risks, outcomes, future plans, and concrete offshore implementations, including information on tasks offshored, launch years,

location choices, delivery models (both captive and outsourced), and performance data. The dataset used for this study includes data from 183 firms, of which 102 are based in the United States and 81 are European. These firms are active in different industries: manufacturing (32%), software (18%), finance and insurance (18%), and technical services (14%). Thirty-five percent of the firms are large (>10,000 employees), 47 percent are medium size (500-10,000 employees), and 18 percent are small (<500 employees). These firms reported 531 offshore implementations, defined as the allocation of particular tasks or processes to a location outside the home country. This implies that each firm has provided data for an average of 3.2 offshore implementations. Offshored tasks may include IT services, administrative services (e.g., Human Resources, legal, finance, and accounting), call centers, software and product development, marketing and sales, and procurement. The three most common services offshored in our sample are IT services (22%), call centers (17%), and engineering services (10%). Offshoring implementations include captive offshoring projects (48%) as well as offshore outsourcing projects (52%). The statistical analysis is conducted on the level of (these 531) offshore implementations.

In addition, we use data from the ORN service provider survey. The service provider survey has collected information from business service providers at the firm and services level since 2007. Survey participants provide information on the services they provide; the locations from which they provide those services; perceived client expectations and operational risks; the performance of service delivery; and various features of the services provided. The latter include such items as the degree of commoditization and the complexity of tasks. The service provider database contains data (as of 2011) from 755 providers based in different countries and regions, including the United States (32%), India (18%), China (4%), other Asian countries (8%), Western Europe (19%), Eastern Europe (7%), and Latin America (6%). The database contains

data from all major large providers (19% of the sample had more than 10,000 employees), including Infosys, Genpact, IBM Global Services, and Wipro. It also covers mid-size providers (37%; 500-10,000 employees) and small providers (44%; <500 employees). Providers in the database offer various services, such as IT services (74% of providers), software development (65%), call centers (48%), finance and accounting (41%), HR services (30%), engineering services (29%), marketing and sales (26%), procurement (25%), R&D (25%), design (19%), and legal (13%). Altogether, the database contains 3,399 service-specific entries, that is, observations related to particular services that providers offer.

For the analysis, we use a hierarchical regression analysis with successive linear regression models, adding more explanatory variables to each model. Ordinary least squares (OLS) models are most suitable for this analysis, as we have a dependent variable with continuous values and as we propose a linear relationship between our dependent variable and the explanatory variables. The hierarchical feature refers to the gradual building of separate but related models with an increasing number of explanatory variables until we reach the final model. We use three different versions of the final model in which all explanatory variables are included. First, we include all implementations in our sample ($N = 531$) to investigate the hypotheses. This model contains both captive and outsourced implementations. However, because there are transactional differences between captive offshoring and offshore outsourcing (see Williamson, 1985), we also split the sample into captive implementations ($N = 253$) and outsourced implementations ($N = 278$), and run the full model for both samples.

Variable construction

The variables, their sources, and their operationalization are presented in Table 2.2. *Cost-estimation error* is measured as the difference between the cost savings expected from the offshoring project and the achieved cost savings. Most firms offshore with the objective of reducing costs (Manning *et al.*, 2008). Thus, a strong empirical proxy of latent hidden costs is the deviation between expected and realized cost savings in offshoring. If expectations perfectly match the savings achieved through offshoring, then there has been no estimation error, but if expectations exceed achieved savings, then expectations have not been met and estimation error has occurred (costs are higher than expected). The few cases in which achieved savings are above expectations ('hidden benefits') are deleted from the sample, as this phenomenon might be explained by factors other than hidden costs. Both expected savings and achieved savings are measured as a share of total costs, so the value of cost-estimation error can vary from zero percent (when achieved savings are equal to expectations) to 100 percent (when expected savings are very high but no savings are actually achieved).

Offshoring complexity is measured along two dimensions: configuration complexity and task complexity. *Configuration complexity* is a composite measure consisting of three dimensions with the purpose of capturing structural, operational, and social complexity, respectively: global diversity of offshore operations (i.e., the number of countries in which a firm is conducting offshoring), disaggregation of activities (the number of services for which a firm engages in offshoring), and spread of employees (the number of persons employed in offshore projects). After each of these dimensions is measured, they are then standardized and mean-centered around zero. The measure of configuration complexity is constructed as the product of these dimensions, which all have an equal weight in the composite measure. This measure is

inspired by previous studies measuring organizational complexity as the degree of firms' functional and occupational differentiation (e.g., Aiken *et al.*, 1980; Blau and McKinley, 1979; Damanpour, 1996). *Task complexity* is measured as the degree to which service providers view a particular task or process as complex. Data on this item is collected in the service provider survey by asking service providers to rank the complexity of different types of tasks on a five-point Likert scale (1 = not complex at all; 5 = very complex). The relatively low correlation of -0.06 (see Table 2.3) between configuration complexity and task complexity indicates that these are two distinct dimensions of offshoring complexity.

Offshoring experience is a simple measure made for each implementation. It is measured as the time (in years) between the launch of the first offshoring project by the focal firm and the initiation of the focal implementation. The assumption is that the longer the respective firm has been engaged in offshoring projects, the more experience it has accumulated. There may be other ways to measure experience, perhaps by taking the number of services offshored or the number of locations offshored into account. However, as we distinguish between experience and offshoring complexity, we focus on years of experience. Importantly, some firms offshore a variety of services to different locations in a short period of time, so that they have little saturated experience. Other firms might focus on offshoring particular functions over a longer period of time. The approach adopted here is akin to that used in other papers (e.g., Lewin *et al.*, 2009).

Organizational design orientation is measured by asking respondents to indicate the extent to which 'business process redesign' is a driver for offshoring particular services on a five-point Likert scale (1 = not important at all; 5 = very important). The measure captures the extent to which offshoring projects that are related to particular services have been implemented in conjunction with optimizing the entire work process. In other words, we use this item as a

proxy for the level of managerial attention (Ocasio, 1997) given to the orchestration of globally distributed processes. The correlation of -0.21 ($p < 0.001$) between the ‘business process redesign’ and ‘labor cost savings’ drivers indicates that the business process redesign driver is clearly distinct from the cost driver. The latter primarily captures managerial attention given to the cost benefits of offshoring particular processes without necessarily considering the impact of any one project on the entire workflow. Therefore, the attention respondents pay to business process redesign when offshoring is viewed as a good proxy for whether they consider the organizational design in the offshoring process.

In addition, a number of control variables are included. First, we control for *cost orientation* (in contrast to organizational design orientation) by including an item on ‘labor cost savings’ as a driver of offshoring implementation. We also include a number of variables from the ORN Service Provider Survey in order to control for different factors at the service level. We control for three transaction-related effects for each offshored service: the frequency of *interactions with the client* (as a proxy for frequency), *interdependence of client* activities (as proxy for asset specificity), and frequency of *disagreements with the client* (as a proxy for uncertainty) (Williamson, 1985). These are ranked on a five-point Likert scale by the service providers for each service in which they are engaged. We also include *commoditization of tasks*, which refers to the process by which processes become less specific to firm or product characteristics, thereby lowering transaction and coordination costs for those firms offshoring those processes (Davenport, 2005). Moreover, the use of *collaborative technologies* in the service is added to control for the use of information and communication technology in the firm. The abovementioned ORN Service Provider Survey control variables are measured using

service-specific variables based on the perception of service providers, which are ranked using five-point Likert scales.

To capture other potential sources of hidden costs (e.g., Stringfellow *et al.*, 2008), we add control variables for interaction distance. These are measured using secondary data on the distance between the home location and the foreign location of the offshore implementation. Interaction distance includes three dimensions: *geographical distance*, measured as air miles between the home location and the offshore location; *cultural distance* between two locations based on the Kogut and Singh index (Kogut and Singh, 1988); and *language distance* as a dummy variable indicating whether the same language is spoken both in the home and offshore locations.

Controls are also included for the three most common services—*IT*, *call center*, and *engineering*—as the level of hidden costs might be affected by characteristics of particular services. As can be seen in the correlation matrix (Table 2.3), the nature of these services is rather distinct in terms of such factors as task complexity. For example, call center services are negatively correlated, engineering services are positively correlated, and IT services are between these extremes. The services are added as dummy variables.

Along similar lines, we include the number of *employees in the home country* to control for firm size. We also control for the type of *delivery model* by using a dummy for captive offshoring versus offshore outsourcing. Finally, we control for the *time* passed (in months) since the project was implemented. As it can be more difficult to retrospectively assess discrepancies between expected and realized costs the older a project is, this control variable captures biases related to the perceptions of the respondents.

Table 2.2 – Operationalization of variables in the models

Variable	Operationalization	Data Source
Cost-estimation error	Percentage of savings expected minus the percentage of savings achieved when offshoring	ORN Client survey
Configuration complexity	The product of the number of services, number of countries, and number of employees (in thousands) that are offshored	ORN Client survey
Task complexity	The average scores at the service level of the provider’s assessment of ‘the complexity of tasks’ (on a five-point scale).	ORN Provider survey
Offshoring experience	Years from the launch of the firm’s first offshoring project to the focal implementation	ORN Client survey
Organizational design orientation	Based on the question: <i>Please indicate the importance of enhancing efficiency through business process redesign as a strategic driver for the offshore implementations</i> (1 = not important at all; 5 = very important)	ORN Client survey
Cost orientation	Based on the question: <i>Please indicate the importance of labor cost savings as a strategic driver for the offshore implementations</i> (1 = not important at all; 5 = very important)	ORN Client survey
Interaction with client	The average scores at the service level of the provider’s assessment of ‘the frequency of client interaction’ (on a five-point scale).	ORN Provider survey
Interdependency of client	The average scores at the service level of the provider’s assessment of ‘the interdependency with processes in client organization’ (on a five-point scale).	ORN Provider survey
Disagreement with client	The average scores at the service level of the provider’s assessment of ‘the frequency of disagreement with client in performing tasks’ (on a five-point scale).	ORN Provider survey
Commoditization	The average scores at the service level of the provider’s assessment of ‘the extent of commoditization today’ (on a five-point scale).	ORN Provider survey
Use of collaborative technologies	The average scores at the service level of the provider’s assessment of ‘the collaborative technologies used in performing tasks’ (on a five-point scale).	ORN Provider survey
Geographical distance	The distance in air miles (in thousands km) between the home location and the offshore location	Google distance calculator
Cultural distance	The Kogut-Singh index of distance between the home location and the offshore location	Hofstede’s measures
Language distance	A dummy indicating whether the main language spoken in the home location is the same as the language spoken in the offshore location (1 = different)	MLA language map
Home employment	Number of employees in home country in thousands	ORN Client survey
IT service	A dummy indicating whether the implementation is an IT service (1 = IT service)	ORN Client survey
Call center service	A dummy indicating whether the implementation is a call center service (1 = call center service)	ORN Client survey
Engineering service	A dummy indicating whether the implementation is an engineering service (1 = engineering service)	ORN Client survey
Outsourcing	A dummy indicating whether the offshore implementation is captive offshoring (= 0) or offshore outsourcing (= 1)	ORN Client survey
Time	Months since the respective offshoring project was implemented	ORN Client survey

The correlation matrix and descriptive data (mean values, standard deviation, and minimum and maximum values) are provided in Table 2.3 and 2.4. In order to detect potential problems of multicollinearity, we look at the correlation coefficients among the independent variables in the models. None of the correlations are above the usual threshold of 0.4 that indicates a possibility of multicollinearity. Hence, the dataset does not seem to suffer from problems of multicollinearity. However, as the task complexity variable is relatively highly correlated with some of the control variables measured at the services level, we ran the models without these variables. All results were qualitatively the same.

The mean value of our dependent variable—cost-estimation errors—is 6.68, indicating that, on average, firms achieved 6.7 percent less savings on their offshoring implementations than they expected. The standard deviation of 10.11 signifies that the observed firms vary in terms of their estimation accuracy, as actually achieved savings span from 25 percent to 100 percent of expected savings. However, a closer look at the frequency of the cost-estimation error variable shows that 52 percent of the implementations (N = 278) show no cost-estimation errors at all (savings meet expectations), while 48 percent reveal different levels of cost-estimation errors (higher costs than expected). In 27 percent of cases, achieved cost savings are lower than expected, but not by more than 10 percent, while in approximately 21 percent of cases achieved savings are more than 10 percent lower than expected. These figures show that there is good variation in the dependent variable across the included firms and also provides evidence that cost-estimation errors are a significant problem facing many offshoring firms.

Moreover, if we divide the sample into captive offshoring and offshore outsourcing, our results show that relatively high cost-estimation error is more common in cases of offshore outsourcing than in cases of captive offshoring. The average levels of cost-estimation error are

Table 2.3 – Summary statistics (n=531)

	Variables	Mean	Std. dev.	Min. values	Max. values
1	Cost-estimation error	6.68	10.11	0	75
2	Configuration complexity	0.04	1.01	-1.16	8.2
3	Task complexity	3.55	0.46	2.88	4.47
4	Offshoring experience	4.46	8.28	0	41
5	Org. design orientation	3.32	1.27	1	5
6	Cost orientation	4.24	1.02	1	5
7	Interaction with client	3.89	0.25	3.57	4.36
8	Interdependency of client	3.63	0.15	3.42	4
9	Disagreement with client	2.45	0.24	2	2.83
10	Commoditization	3.19	0.42	2.38	3.87
11	Collaborative technology	3.36	0.14	2.97	3.75
12	Geographical distance	8.52	4.19	0	16.24
13	Cultural distance	8.89	5.49	2	31.48
14	Language distance	0.56	0.5	0	1
15	Home employment	21.8	41.1	1	385
16	IT service	0.22	0.41	0	1
17	Call center service	0.17	0.37	0	1
18	Engineering service	0.1	0.3	0	1
19	Outsourcing	0.52	0.5	0	1
20	Time	7.4	4	2	38

7.92 for offshore outsourcing and 5.32 for captive offshoring (which is a significant difference in an analysis of variance, $p < 0.01$). Furthermore, 26 percent of all offshore outsourcing cases report that costs were more than 10 percent higher than expected, while this is true for only 16 percent of the captive offshoring cases. When expected and achieved savings are examined separately, we find that the difference in cost-estimation error is due to expected savings being significantly higher for offshore outsourcing, while the achieved savings are at the same level for captive and outsource offshoring. We explore this difference later in the paper.

Table 2.4 – Correlation matrix (n=531)*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1.00																			
2	0.11	1.00																		
3	0.09	-0.06	1.00																	
4	-0.09	-0.06	-0.14	1.00																
5	0.02	0.07	-0.07	0.20	1.00															
6	0.09	0.06	0.04	-0.31	-0.21	1.00														
7	0.08	-0.06	0.31	0.03	-0.05	-0.06	1.00													
8	0.04	-0.05	0.21	-0.02	-0.01	0.09	0.31	1.00												
9	0.05	0.08	0.10	-0.12	0.03	0.09	-0.15	0.05	1.00											
10	-0.07	0.13	-0.32	-0.09	-0.05	0.11	-0.24	-0.33	-0.25	1.00										
11	-0.07	0.05	-0.23	0.04	-0.06	-0.07	-0.05	-0.19	0.01	0.30	1.00									
12	0.04	0.11	0.08	-0.30	-0.08	0.26	-0.02	0.08	0.13	-0.01	0.01	1.00								
13	-0.03	-0.01	0.03	0.01	0.01	-0.02	0.11	0.03	0.03	-0.12	0.11	0.18	1.00							
14	0.01	-0.11	0.06	0.27	0.01	-0.25	0.20	0.01	-0.12	-0.17	0.04	-0.23	0.29	1.00						
15	-0.03	0.23	-0.15	-0.12	-0.04	0.15	-0.16	-0.05	0.01	0.15	0.04	0.13	-0.03	-0.12	1.00					
16	0.04	0.01	-0.03	-0.15	-0.03	0.14	-0.31	-0.27	0.28	0.33	-0.21	0.07	-0.04	-0.12	0.10	1.00				
17	-0.05	0.14	-0.35	0.06	-0.01	0.01	-0.27	-0.18	-0.29	0.38	0.36	-0.10	-0.07	-0.02	0.12	-0.23	1.00			
18	-0.06	-0.02	0.31	0.04	-0.05	0.03	0.11	0.35	-0.24	-0.27	-0.32	0.07	0.01	0.02	0.01	-0.18	-0.15	1.00		
19	0.13	0.05	0.03	-0.19	-0.07	0.18	-0.03	-0.11	0.01	0.14	0.06	0.09	-0.01	-0.16	0.01	0.14	0.07	-0.07	1.00	
20	-0.14	-0.01	0.06	0.12	0.01	-0.04	0.16	0.04	-0.10	-0.14	-0.06	-0.18	-0.12	0.15	0.02	-0.03	-0.06	-0.03	-0.14	1.00

*All values greater than 0.09 are significant at the 5% level.

2.4 RESULTS

The results of the hierarchical regression model are presented in Table 2.5. Model 1 includes the control variables and the two explanatory variables reflecting offshoring complexity: configuration complexity and task complexity. We add the two moderating variables—organizational design orientation and offshoring experience—in Model 2. In Model 3, we add the interaction effect between the two complexity variables and our two moderating variables.

In all three models, the two complexity variables are significant ($p < 0.05$) and positive, which supports the hypothesis that offshoring complexity is an important determinant of cost-estimation error as manifested in hidden costs of offshoring (Hypothesis 1). Model 1, which includes the two complexity variables, obtains an R^2 value of 0.11. When the two moderating variables are added in Model 2, the R^2 only increases to 0.12, which is due to the fact that none of the moderating variables are significant in this model. In Model 3, we go one step further and include the four interaction terms in order to test for the proposed moderating effects (Hypotheses 2 and 3). However, the model does not improve, as the R^2 only increases to 0.13 with the use of four additional degrees of freedom. Moreover, only the interaction terms between task complexity and organizational design orientation are negative and significant as expected ($\beta = -1.78, p < 0.05$).

Notably, some of the control variables are significantly related to cost-estimation error. Those factors increasing cost-estimation errors include cost orientation, task interdependence with client activities, cultural distance, language distance, and call center services, while commoditization and time passed since the initiation of the offshoring project lower cost-estimation errors. These results support complementary explanations for cost-estimation error and hidden costs, as they highlight transactional factors, such as task interdependency with client

Table 2.5 – Hierarchical regression models (n=531) – standard errors in parenthesis

	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>	<i>Model 5</i>
	Cost-estimation error in decision making				
	<i>All implementations</i>			<i>Captive offshoring</i>	<i>Offshore outsourcing</i>
Configuration complexity	0.19** (0.06)	0.19** (0.06)	0.40* (0.19)	2.14*** (0.47)	0.10 (0.63)
Task complexity	6.71* (2.73)	6.41* (1.86)	12.59** (3.86)	7.46 (5.02)	23.09*** (5.53)
Organizational design orientation		-0.13 (0.35)	-0.67* (0.28)	-1.64 (1.85)	-1.09* (0.41)
Offshoring experience		-0.04 (0.06)	-0.48 (0.46)	-0.12 (0.08)	-0.14 (0.09)
Configuration complexity*			-0.04 (0.09)	-0.29** (0.11)	-0.02 (0.17)
Organizational design orientation					
Configuration complexity*			-0.04 (0.03)	-0.06* (0.02)	-0.03 (0.06)
Offshoring experience					
Task complexity*Organizational design orientation			-1.78* (0.78)	0.60 (1.04)	-2.80* (1.11)
Task complexity*Offshoring experience			0.13 (0.14)	0.01 (0.14)	-0.45† (0.26)
Costs orientation	1.07* (0.47)	0.98* (0.49)	1.04* (0.50)	-0.46 (0.55)	2.25* (0.87)
Commoditization	-15.21*** (4.25)	-15.01*** (4.29)	-15.65*** (4.28)	-4.37 (5.46)	-23.99*** (6.12)
Use of collaborative technologies	-1.77 (4.77)	-1.85 (4.78)	-1.61 (4.79)	-3.22 (6.71)	7.14 (6.79)
Interaction with client	9.31 (5.98)	8.88 (6.03)	9.13 (6.03)	2.03 (7.55)	19.83* (8.99)
Interdependency of client	12.94** (4.62)	12.91** (4.64)	13.31** (4.63)	2.60 (5.73)	25.16** (7.61)
Disagreement with client	7.49 (4.61)	7.41 (4.61)	8.46 (4.67)	0.19 (6.04)	6.38 (7.91)
Geographical distance	0.21 (0.14)	0.20 (0.14)	0.21 (0.14)	0.39* (0.17)	0.07 (0.21)
Cultural distance	0.23* (0.10)	0.23* (0.10)	0.24* (0.10)	0.15 (0.11)	0.36* (0.16)
Language distance	2.83* (1.28)	2.93 (1.29)*	2.91* (1.28)	3.89* (1.59)	1.35 (1.86)
Call center service	16.45** (5.08)	16.20** (5.11)	18.02*** (5.19)	0.95 (6.81)	25.22** (8.10)
IT service	2.49 (1.72)	2.45 (1.72)	2.73 (1.73)	3.78† (2.11)	2.42 (2.88)
Engineering service	-2.68 (2.01)	-2.51 (2.03)	-2.42 (2.03)	-1.88 (2.36)	-2.59 (3.31)
Home employment	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
Time	-0.39*** (0.11)	-0.38*** (0.11)	-0.38** (0.11)	-0.37** (0.13)	-0.29 (0.19)
Outsourcing	1.78* (0.90)	1.75† (0.90)	1.47 (0.90)		
Intercept	55.20*** (14.43)	45.01** (18.00)	35.32* (19.14)	27.42 (16.67)	83.97† (44.62)
N	531	531	531	253	278
F-value	4.07***	3.66***	3.38***	5.42***	2.86***
R-square	0.11	0.12	0.13	0.34	0.20

†, *, **, and *** indicate significance levels of 10%, 5%, 1%, and 0.1%, respectively. The significant hypothesized relationships are in bold.

operations and interaction distance like cultural and language distance (see Stringfellow *et al.*, 2008). In addition, the outsourcing variable is significant in Model 1 ($\beta = 1.78$, $p < 0.05$), which reflects the higher level of cost-estimation error for offshore outsourcing as compared to captive offshoring.

In order to go beyond just adding the outsourcing variable as a control variable, the full model is applied to the two samples of captive offshoring and offshore outsourcing in Models 4 and 5, respectively. Interestingly, the R^2 increases substantially in both cases, reaching 0.34 in the case of captive offshoring and 0.20 for offshore outsourcing. However, it is also obvious that the variables have different effects in the subsamples. In fact, no variable is significant in both subsamples. In the case of captive offshoring, configuration complexity significantly increases cost-estimation errors ($\beta = 2.14$, $p < 0.001$), while task complexity is insignificant. Both interaction terms—configuration complexity in terms of organizational design orientation and offshoring experience—are significant and negative ($\beta = -0.29$, $p < 0.01$ and $\beta = -0.06$, $p < 0.05$, respectively), while neither organizational design orientation nor offshoring experience by themselves have significant effects. These results are in line with Hypotheses 2 and 3, which propose that organizational design orientation and offshoring experience negatively moderate the positive relationship between complexity and hidden costs. Of the control variables, the most notable are the significant positive distance variables (geographical and language distance), which indicate that cost-estimation errors increase as the distance between the home location and the offshore location increases.

In the case of offshore outsourcing implementations, task complexity is significant and positive ($\beta = 23.09$, $p < 0.001$), while configuration complexity is insignificant. The two interaction terms with task complexity are also significantly negative, although the interaction

term between task complexity and offshoring experience is only moderately significant ($\beta = -0.45$, $p < 0.1$). This provides further support for Hypotheses 2 and 3, indicating that organizational design orientation and experience mitigate cost-estimation errors in the case of offshore outsourcing as well. Of the control variables, it is evident that the more task-oriented variables (such as commoditization) and transaction-oriented variables (such as interaction with client and interdependency with client operations) are significant in predicting cost-estimation errors in outsourcing implementations.

In order to test the robustness of our findings, we conduct a number of alternative specifications of our models. These alternative specifications included Tobit models (as we have a skewed dependent variable), logistic models (a binary dependent model with or without hidden costs), and random coefficients models (controlling for firm effects). All of these models provide qualitatively similar, but weaker, results than the one reported here. In addition, we believe that from a theoretical point of view we have applied the most appropriate model in order to test the hypotheses, as our dependent variable is measured on a continuous scale, and as the question of whether hidden costs and cost-estimation error exist cannot be separated from the level of hidden costs. Both aspects are determined simultaneously in our preferred model.

Furthermore, we have addressed the issue of endogeneity, that is, whether the complexity variables are endogenously determined by the same factors as the estimation errors, because those managers who underestimate costs might also offshore more and thereby increase the complexity. We did so by running simultaneous equation models with instrumental variables. For this purpose, we used a set of instruments that is correlated with the endogenous variable (complexity, in our case) but not correlated with the error from the regression in which the endogenous regressor appears (Stock *et al.*, 2002). From a theoretical perspective, it seems likely

that the ‘objective’ instruments in our model—geographical distance, home employment, and call center service, which are all correlated with the complexity variables (see Table 2.3)—would pass this test. In addition, from an empirical perspective, there seems to be limited evidence of endogeneity problems as all of the results remain qualitatively the same in the simultaneous equation models with instrument variables. Accordingly, the Hausman test favors the use of OLS models, which is also hinted at by the low correlations (0.09-0.11) between the complexity variables and cost-estimation errors (see Table 2.4). In addition, to test for over-identifying restrictions, we regressed the residual from the cost-estimation error equation on the instruments for the model (Sargan, 1958). The R^2 value in this regression is very low (0.0084) and none of the predictors are statistically significant. We also inspected the bivariate correlations between the instruments and the residuals, all of which were insignificant and close to zero. In combination, these tests do not provide absolute proof of the absence of endogeneity (see, e.g., Hahn *et al.*, 2011), but they do suggest that the problem has been addressed in our model.

2.5 DISCUSSION

Firms and their managers often find that the initial objectives of strategic decisions are substantially undermined by hidden costs of implementation (e.g., Dibbern *et al.*, 2008; Reitzig and Wagner, 2010; Stringfellow *et al.*, 2008). In this paper, we have argued that hidden costs—implementation costs that are neglected in strategic decision making—occur in situations of complexity in which decision makers are likely to be subject to bounded rationality. Faced with high complexity, decision makers are more likely to ignore the consequences of implementation and organizational change, and therefore fail to estimate the actual costs of a strategic decision. Hence, estimation errors are the manifestation of underlying and latent hidden costs.

We have studied the phenomenon of such estimation errors in the context of the offshoring of administrative and technical services. Firms offshore service activities for a number of reasons: to reduce costs, to acquire strategic resources, and to gain market proximity (e.g., Lewin *et al.*, 2009). Accordingly, we have argued that hidden costs occur in offshoring when the relocation of service activities abroad entails implementation costs that are initially ignored or unanticipated by decision makers.

Based on comprehensive data from the ORN, we have developed a model of hidden costs that highlights the roles of offshoring complexity (task and configuration complexity), organizational design orientation, and experience in explaining why decision makers systematically fail to estimate the actual costs of services offshoring. In general, we find empirical support for our model: offshoring complexity increases cost-estimation errors (Hypothesis 1), whereas design orientation (Hypothesis 2) and experience (Hypothesis 3) negatively moderate this relationship. However, while captive offshoring is much more responsive to broader configuration and design factors, hidden costs in offshore outsourcing are more driven by task- and transaction-related factors.

Our findings correspond to recent research suggesting that firms with a strategic, rather than opportunistic, approach to offshoring decisions are not only likely to generate higher savings but are also more accurate in their savings expectations (e.g., Lewin and Couto, 2007; Massini *et al.*, 2010). However, rather than looking at strategies in general, we focus on indicators of a firm's orientation toward improving and orchestrating organizational processes and structures through and alongside offshoring. Interestingly, a design orientation does not seem to reduce hidden costs *per se*; only when the complexity of offshore operations increases does a strong orientation toward orchestrating different structures and processes reduce hidden costs.

This can be partly explained by the fact that as firms increase the scale and scope of offshoring, they may reach a tipping point where existing processes and structures conflict with the new setup of the globally dispersed operations (Massini *et al.*, 2010). At this point, only those firms actively seeking to reorganize their structures and processes in a coherent way may benefit from an increased scale and scope of offshoring. While this clearly hints at the transformational potential of offshoring, it also points to the need for firms to actively manage this potential, and to match the increasing relocation of processes with the adaptation of organizational structures and capabilities (Manning *et al.*, 2008).

In addition, we find that cost-estimation errors due to hidden costs are significantly higher in offshore outsourcing implementations than in captive offshore implementations. Our results also indicate that in the case of captive (internal) offshoring, hidden costs increase with configuration complexity, whereas hidden costs result from increased task-level complexity in the case of offshore outsourcing. This highlights that task- and relationship-specific uncertainty, along with transaction costs, strongly affect overall operational costs in the case of outsourcing. In this regard, several studies show how certain design capabilities and mechanisms at the task level, such as contract design (Argyres and Mayer, 2007) and the alignment of client and vendor operations (Manning *et al.*, 2011), can help firms better anticipate and manage operational costs outside their immediate control. Similarly, outsourcing typically involves tasks that are more standardized than those in captive offshoring (as indicated by the significant positive correlation of 0.14 between task commoditization and outsourcing in Table 2.4). In contrast, captive offshoring is more exposed to configuration complexity issues, which increase the role of organizational design, as the decision maker has more discretion to make changes in the organization of internal activities. In comparison, task complexity in the case of captive

operations does not significantly increase hidden costs, which indicates a greater internal capacity to manage (and plan for) complex tasks. Importantly, however, as offshoring complexity grows *beyond* certain tasks, hidden costs become an issue in captive operations, a finding that points to the roles of design and experience in safeguarding operations as offshoring increases in scale and scope.

The present study has important implications for ongoing research on hidden costs of globally dispersed and complex operations. The concept of hidden costs in the offshoring literature is new and has so far only been used conceptually to underscore how the relocation of activities abroad might be more challenging than initially expected (e.g., Dibbern *et al.*, 2008; Stringfellow *et al.*, 2008). We contribute to this research by uncovering drivers of estimation errors and the potential to foresee hidden costs when integrating globally dispersed and disaggregated operations into an orchestrated organization (Kumar *et al.*, 2009; Srikanth and Puranam, 2011).

On a more general level, this study helps us better understand estimation biases in strategic decision making, and the effects of experience and organizational design orientation on those biases (e.g., Durand, 2003; Hogarth and Makridakis, 1981; Kahneman and Lovallo, 1993; Makadok and Walker, 2000; March and Simon, 1958). A firm's estimation ability captures how accurately it can estimate and forecast the outcomes of organizational changes resulting from the implementation of a strategic decision (Kahneman and Tversky, 1984). However, while the inhibiting role of complexity in decision-making processes is well established (Langlois and Robertson, 1992; Loasby, 1976; Nickerson and Zenger, 2002), we have shown that this relationship is negatively moderated by the organizational design orientation of the decision maker (Ocasio, 1997). As the implementation of a strategic decision, such as the relocation of

activities abroad, entails organizational changes, the decision maker must direct attention to how these changes might affect such aspects as the coordination of joint and interdependent organizational action (Thompson, 1967), information processing demand (Simon, 1955), and organizational response capacity (Anderson, 1999).

Moreover, we have argued that the accumulation of organizational system knowledge (Brusoni and Prencipe, 2006; Henderson and Clark, 1990) is necessary for the decision maker to make effective strategic decisions in a context of complexity. Decision makers need experience and knowledge about the aspects of organizational design that deserve their attention. Thus, in viewing a firm's estimation ability as a distinctive organizational competence (Durand, 2003; Hogarth and Makridakis, 1981; Makadok and Walker, 2000), this study implies that the fit between complexity and organizational design plays a key role in the implementation of strategies and should therefore be incorporated in strategic analyses.

Our findings also add to research on appropriate organizational designs in complex environments (Ethiraj and Levinthal, 2004a; Nadler and Tushman, 1997) by stressing that the recent offshoring trend challenges the capacity of conventional organizational forms and structures to facilitate and safeguard globally dispersed operations (Srikanth and Puranam, 2011). Future research should aim to better understand the effects of different design alternatives and mechanisms that firms utilize when they reach a certain level of complexity. A related issue is the extent to which design elements can be 'firm specific'—reflecting more or less specific locations and processes across countries and locations.

In addition, we emphasize the role of experience in strengthening the moderating effect of complexity on hidden costs. In this regard, we support research that underscores the central role of knowledge evolution in organizational change and design (Brusoni and Prencipe, 2006;

Henderson and Clark, 1990). We can assume that different forms of experience and learning might contribute differently to organizational behavior and performance (Haunschild and Sullivan, 2002; Madsen and Desai, 2010). Future research could therefore investigate which types of experience and learning contribute the most to the identification of organizational forms and structures in increasingly complex firms.

Limitations and future research

Our study has some limitations that should be addressed in future research. First, the concept of hidden costs is difficult to measure. We operationalized it as the respondents' perceptions of the difference between the expected and realized savings of offshoring, using cross-sectional observations. However, this operationalization might be skewed (Golden, 1992), especially as we ask for retrospective views about initial expectations. As a result, hidden costs might be underestimated in our study (although our results still hold despite the possible conservative bias of the dependent variable). A research design using observations collected before and after the offshoring implementation would have obvious advantages compared to the design used in this study. Also, as we primarily relied on survey data, we were unable to analyze the actual decision-making process and we did not look at specific implementation processes in detail. Future studies can use qualitative research designs to better address the various factors contributing to the ignorance of implementation costs in decision-making processes under conditions of complexity.

We have also limited the theoretical explanation of our dependent variable to the role of the organizational context in the decision maker's estimation ability, thus leaving out an important discussion on intentionality (Hutzschenreuter *et al.* 2007; Salas *et al.*, 2010). For

instance, situations of complexity may entail increased uncertainty, which invites political processes in decision making. In such situations, stakeholders may seek influence by emphasizing arguments that serve their own interests while downplaying others (Eisenhardt and Bourgeois, 1988). Decision makers may also follow institutional norms, bureaucratic procedures, and prior strategic commitments to reduce uncertainty and ambiguity (DiMaggio and Powell, 1983), thereby allowing for solutions that might be inefficient. Thus, while we assume that the organizational environment has a significant influence on decision-making processes in which some cost factors are unintentionally ignored, other cost factors may be intentionally downplayed in order to promote particular decisions. In this sense, a strong orientation toward organizational design could be a way to address politics within the organization. Future research could therefore investigate the ramifications of intentional underestimations of costs in complex organizations. For instance, is there evidence that decision makers intentionally underestimate the costs of implementing strategic decisions? How might variables such as complexity, organizational design orientation, and experience affect decision makers in terms of intentionally underestimating future costs?

Concluding remarks

In conclusion, by explaining deviations between strategic objectives and actual performance through the concept of hidden costs, an important field of research is unlocked that can more accurately clarify unintended consequences of firms' strategic behavior. While we found that complexity, along with experience and orientation toward organizational design, explained much of this deviation, a number of other contingencies should be examined in future research. In this regard, our study suggests that drivers of hidden costs within the boundary of the firm may differ

from hidden costs in the context of interorganizational arrangements. This difference deserves further exploration. Finally, our study highlights services offshoring as an increasingly important empirical field for investigating strategic decision making, complexity, and design in contemporary organizations.

Chapter 3

Foreseeing reconfiguration costs and the role of modularity: A study on offshoring process performance

Marcus Møller Larsen¹

Abstract: Decision makers' estimations of the costs of implementing strategic decisions are often surpassed by actual cost levels. This paper investigates the performance consequences of these situations. Using unique data on 221 offshoring implementations, it is argued that reconfiguration cost estimation errors of implementing an activity in a foreign location have a negative impact on the process performance of that activity as operations are likely to be disrupted by opportunity costs and managerial responses. However, this relationship is mitigated by the degree of modularity in the activity as it reduces the need for costly coordination in offshoring. This paper contributes to research on offshoring and strategic decision-making by emphasizing the importance of organizational design and of estimating the costs of internal organizational change.

Keywords: organizational reconfiguration, cost estimation error, modularity, performance, offshoring.

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3.1 INTRODUCTION

In strategic decision-making, a main function relates to decision makers' accurate estimation of the costs of implementing strategic decisions (Durand, 2003; Eisenhardt and Martin, 2000; Makadok and Walker, 2000). For example, when firms diversify their operations, decision makers need to make important cost estimations on the changes in the organization and the environment so that future resource allocations can be planned and aligned. Often, however, firms experience that actual costs of implementing strategic decisions outweigh expected costs. In particular, firms find that certain costs remain hidden in the decision making process, and are only realized as 'post decision surprises' (Harrison and March, 1984) after the decision has been implemented (see e.g., Dibbern *et al.*, 2008; Larsen *et al.*, 2012; Reitzig and Wagner, 2010; Stringfellow *et al.*, 2008).

The purpose of this paper is to investigate the performance consequences of these 'hidden costs,' i.e., the situations where decision makers' fail to effectively estimate the costs of implementing strategic decisions. Prior research has investigated the link between firms' estimation ability and performance (e.g., Durand, 2003; Eisenhardt and Martin, 2000; Makadok and Walker, 2000), but has predominantly focused on the estimation of external events such as future changes in markets and industries, and less on internal organizational changes and reconfigurations. However, firms continuously reconfigure and change their organizations to optimize performance through measures such as the patching, recombination and reconfiguration of firm activities (Eisenhardt and Brown, 1999; Karim and Mitchell, 2004), resources (Henderson and Clark, 1990; Galunic and Rodan, 1998), and divisional boundaries (Hoskisson and Johnson, 1992; Birkinshaw and Lingblad, 2005). In these processes, firms incur reconfiguration costs such as financial costs, temporal costs, cognitive learning costs and

opportunity costs (Lavie, 2006; Zollo and Winter, 2002). Thus, reconfiguration costs are the costs that occur as a result of the organizational reconfiguration. This paper investigates the performance consequences of the situations where reconfiguration costs are underestimated. Specifically, this paper uses the context of offshoring to investigate the process performance effects of the situations in which decision makers' fail to correctly estimate the costs of relocating organizational activities to foreign locations.

Offshoring is an organizational reconfiguration in which tasks and services are relocated to locations outside the home country in internal, outsourced or collaborative governance modes (Lewin and Peeters, 2006; Contractor *et al.*, 2010). While the majority of offshoring research has focused on questions relating to offshoring drivers, governance modes, location choice, and immediate outcomes (e.g., Lewin *et al.*, 2009; Kedia and Mukherjee, 2009; Mol *et al.*, 2005), recent research has pointed out that firms often find actual costs levels of implementing offshoring activities abroad higher than expected (Dibbern *et al.*, 2008; Larsen *et al.*, 2012; Stringfellow *et al.*, 2008). For example, firms experience that the local labor costs increase beyond expectations and that offshoring operations require substantially more knowledge transfer and control than originally accounted for. As such, bounded rational decision makers are unable to foresee the full consequences of offshoring and are, as a result, incapable of making precise estimations of the costs of implementing offshoring activities abroad.

Using unique data on 221 offshoring implementations, it is argued that decision makers' inability to effectively estimate the reconfiguration costs of implementing an activity in a foreign location has a negative impact on the process performance of that activity. Specifically, the opportunity costs of wrongly estimating reconfiguration costs negatively influence the process performance of the activity as the operations of the activity are likely to be disrupted by

managerial responses to the cost estimation errors. However, it is also argued that process performance is positively moderated by the modularity of the offshored activities. Assuming that complexity and the increased need for coordination are important sources of cost estimation failures (Larsen *et al.*, 2012), modularity offers an important mechanism to reduce the need for coordination when offshoring (Srikanth and Puranam, 2011), and as such positively moderates process performance.

These findings contribute to ongoing research on offshoring by emphasizing the importance of reconfiguration costs estimation in the offshoring processes, and particularly to research that investigates offshoring performance (e.g., Lewin and Peeters, 2006; Mol *et al.* 2005; Massini *et al.*, 2010). Moreover, this paper adds to research on hidden costs by emphasizing how modularity may positively moderate the negative consequences of reconfiguration cost estimation errors (e.g., Dibbern *et al.*, 2008; Larsen *et al.*, 2012; Stringfellow *et al.*, 2008). Finally, this research contributes more generally to research on firms' estimation abilities (Durand, 2003; Makadok and Walker, 2000), strategic decision-making effectiveness (Dean and Sharfman, 1996), and organizational reconfiguration (Karim and Mitchell, 2004) by emphasizing the importance of estimating the costs of internal organizational change, while, at the same time, aligning firms' coordination mechanisms to the new organizational requirements.

The paper is organized as follows: First, the theory on decision making and performance is discussed. Second, the hypotheses explaining the relationship between reconfiguration cost estimation errors and performance and the moderating effect of modularity are developed. Third, the dataset and methods used to explain process performance is introduced. Finally, the results

are presented before the findings are discussed and related more broadly to research on offshoring and decision making.

3.2 THEORETICAL BACKGROUND

Estimation and performance

Strategic decision-making describes the commitment to important decisions in terms of actions taken, resources devoted or precedents set (Dean and Sharfman, 1996; Eisenhardt and Zbaracki, 1992; Mintzberg *et al.*, 1976). A main function in strategic decision-making is the ability to estimate and forecast the costs of implementing the strategic decision (Durand, 2003; Makadok and Walker, 2000). Firms' estimation ability thus refers to how accurately the consequences of implementing a strategic decision can be estimated and forecasted.

Much research has focused on factors that influence the decision-making process, such as the organizational environment (March and Simon, 1958), routines (Nelson and Winter, 1982), managerial dominant logic (Prahalad and Bettis, 1986), individual biases (Das and Teng, 1999), and politics (Eisenhardt and Bourgeois, 1988). However, there is only limited evidence on how firms' estimation ability influences performance. For example, Dean and Sharfman (1996) investigate the relationship between the strategy process and decision-making effectiveness, and find that procedural rationality and political behavior are significantly related to the extent to which the objectives of strategic decisions are effectively met. However, they do not provide any causal argumentation of whether strategic decision-making effectiveness eventually corresponds with performance. Equally, in a study on firms' forecasting ability, Durand (2003) investigates the role of organizational illusion of control and organizational attention in pinpointing firms' ability to forecast future industry growth rates, but leaves out the effects on performance.

There are some important exceptions that discuss and investigate the relationship between estimation ability and performance, however. For example, Eisenhardt and Martin (2000) suggest that the performance of a firm is strongly influenced by its ability to match its resource allocation pace to the anticipated changes of its environment. Makadok and Walker (2000) investigate forecasting ability in the money fund industry, and find a positive relationship between the funds' ability to forecast changes in monetary markets and their subsequent economic surplus and growth. This may also relate more generally to studies that investigate the relationship between firms' capabilities and performance. For example, Henderson and Cockburn (1994) measure firms' ability to integrate knowledge within the firm at the R&D program level to predict patenting productivity. Ethiraj *et al.* (2005) examine the choices made by a single firm over time and evaluate the performance trade-offs of the marginal returns to the different capabilities that it seeks to build.

Accordingly, there are indications in the literature that firms' ability to estimate and anticipate changes in the environment has important effects for firm performance (e.g., Makadok and Walker, 2000). This paper aims to build on this literature. Specifically, while the majority of extant literature investigates decision effectiveness in relation to forecasting external events such as industry growth and market changes, little research has investigated firms' estimation ability in regards to the costs of organizational reconfiguration. This is nonetheless an important topic to investigate. Organizational reconfiguration can be defined as the changes to firms' organization, such as resource allocations, use of internal routines and communication network, and the flow of information and tasks, with the purpose of increasing effectiveness and efficiency (Chandler 1962, Levitt and March 1988, Galunic and Eisenhardt 1996, Helfat and Eisenhardt 2004; Karim 2009). Organizational reconfiguration does not come without costs, however. Lavie (2006), for

example, argue that a reconfiguration process entails costs such as monitoring, evaluation, termination, learning, unlearning, adaptation, integration, deliberation, and codification. A firm that reconfigures may experience that the costs of unlearning old routines and learning new routines increases (Zollo and Winter, 2002). A firm may also experience that the costs of control and coordination increases as a results of reconfiguring the organization (Dibbern *et al.*, 2008). At the same time, however, Lavie (2006: 161) stresses that too little research analyzes reconfiguration costs and their implication, and suggests that “*an intendedly rational choice of reconfiguration mechanism takes into account the associated costs and risks.*”

In an attempt to address this gap, this paper investigates the relationship between the estimation of the costs of reconfiguring the organization by relocating and implementing a given activity in a foreign location (i.e., offshoring) and the process performance of that activity.

Estimating reconfiguration cost in offshoring

Offshoring—i.e., the relocation of firm activities to foreign locations (Contractor *et al.*, 2010)—can be seen as an organizational reconfiguration to the extent that it requires change in the geographical location of an activities that the firm already is in possession of. Firms relocate activities to foreign locations with purposes such as lowering labor and production costs (Dossani and Kenney, 2003) and accessing to talent and qualified labor (Lewin *et al.*, 2009). Research has also pointed out that offshoring decisions are often taken as bottom-up opportunistic decisions, without the support of a corporate strategy guiding offshoring practices (Lewin and Peeters, 2006; Massini *et al.*, 2010).

A firm engaging in offshoring must make important decisions on a number of operational issues. For example, decisions must be made regarding the contractual ownership and

relationship of the offshoring setup (Vivek *et al.*, 2009), the host location (Graf and Mudambi, 2005), the level of disaggregation or ‘fine-slicing’ of the overall value chain to identify the specific tasks to be offshored (Mudambi and Venzin, 2010), the choice of different coordination mechanisms (Kumar *et al.*, 2009), and the overall coherence and integration of the globally dispersed organizational system (Srikanth and Puranam, 2011).

Important for decisions like these is the decision makers’ ability to effectively estimate the costs of reconfiguring the organization when implementing the offshoring activity abroad. In order to match future resource allocations to the anticipated changes in the organization resulting from offshoring, decision makers must make important estimations regarding the implementation costs of relocating the activities abroad. During the onshore transition phase concerning the preparation of moving activities from the onsite location to the offshore location, the decision maker needs to estimate the organizational demands and consequences of relocating the activity abroad. This way, the firm can invest in the necessary resources in order to arrange for an efficient relocation and subsequent organizational reintegration (Mudambi and Venzin, 2010).

Table 3.1 – Reconfiguration costs

Reconfiguration costs	Explanation
<i>Control costs</i>	The costs of controlling the performance and coherency of the offshored activity.
<i>Coordination costs</i>	The costs of coordinating and integrating the domestics and foreign resources to achieve the specified objectives.
<i>Design costs</i>	The costs of accurately specifying and designing the business tasks to be offshored.
<i>Knowledge transfer costs</i>	The costs of the transferring and communicating knowledge between the domestic and foreign location.

Adapted from Dibbern *et al.* (2008).

However, in contrast to situations where decision makers effectively foresee and estimate the costs of implementing the activity in an offshore location so that expectations can be met, situations with high cost estimation errors suggest that decision makers are unable to account for the organizational requirements and demands of the offshoring activity prior to implementation. As such, decision makers are faced with ‘post-decision surprises’ (Harrison and March, 1984). For example, firms may experience that local labor and resource costs inflate beyond initial estimations. The offshoring implementation may turn out to require additional personnel and training than was originally anticipated and budgeted for to facilitate an effective offshoring operation (Lewin and Peeters, 2006). Different integration mechanisms may prove inferior in comparison to expectations so that additional resources must be invested in new mechanisms (Srikanth and Puranam, 2011). Dibbern *et al.* (2008) argue that unexpected reconfiguration costs in offshoring can be distinguished between coordination costs, control costs, design costs, and knowledge transfer costs (see Table 3.1).

In general, these reconfiguration costs estimation errors suggest that the presence of bounded rational decision makers (Simon, 1955), who are due to reasons such as complexity not at the point of decision making able to foresee and estimate the consequences of relocating an offshoring activity in a foreign location (Larsen *et al.*, 2012).

3.3 HYPOTHESIS DEVELOPMENT

Offshoring process performance consequences

The purpose of this paper is to investigate the performance consequences of this type of cost estimation errors. Different studies have provided different financial and non-financial measures and results on offshoring performance. On the one hand, research employing financial measures

to investigate offshoring performance has looked at aspects such as corporate financial performance (Mol *et al.*, 2005), cost savings (Lewin and Peeters, 2006), export performance (Bertrant, 2011), and sales growth (Murray *et al.*, 1995). On the other hand, research employing non-financial measures to investigate offshoring performance has emphasized aspect such as learning and organizational transformation (Jensen, 2009; Maskell *et al.*, 2007), innovation performance (Nieto and Rodríguez, 2011), market shares (Kotabe and Murray, 1990), and implementation time (Hutzschenreuter *et al.*, 2011b).

The focus of this paper, however, is to investigate how reconfiguration cost estimation errors affect the process performance of an activity after it has been relocated to a foreign location. Following Srikanth and Puranam (2011), the activity's process performance is defined as "*cost reductions and/or performance improvements that occur in the immediate aftermath of moving the process offshore*" and may relate to factors such as the cost demand, service quality improvements, and satisfaction with service of a given activity. For example, firms may experience that the relocation of a given activity to a low-cost country decreases the cost demand of the activity due to preferable labor, production and resources costs levels compared to the country it was moved from (Kedia and Lahiri, 2007; Manning, *et al.*, 2008). Firm may also experience that the operational flexibility and production quality will improve by moving the activity offshore due to superior technologies in the host location (e.g., Lewin and Peeters, 2006). As such, process performance refers to the isolated performance of a given activity, and the purpose of this paper is to investigate how the failure to effectively estimate the costs of reconfiguration (e.g., Lavie, 2006) when implementing an activity in a foreign location influences this.

When decision makers fail to correctly estimate the actual reconfiguration costs of implementing an offshoring activity abroad, a typical response would be to take different measures to best accommodate for these estimation errors. For example, a firm that experience that reconfiguration costs relating to knowledge transfer are much higher than initially expected may decide to down-scale the offshoring operations. A firm that experiences that the costs of coordinating and controlling a foreign instead domestic activity exceed expectations may fail to implement an appropriate coordination mechanism, and as a result the more likely is coordination failure. In some cases, firms may also decide to ‘backsource’ or re-nationalize the previously offshored activities due to exceeding levels of reconfiguration costs (Chadee and Raman, 2009).

In these situations of reconfiguration cost estimation errors, firms incur substantial opportunity costs. For example, rather than on allocating appropriate resources to the offshoring operations, the attention of the decision maker is likely to be directed at adjusting the expectations (e.g., Ocasio, 1996). The benefits of using low-cost production may be offset by unexpected additional resources invested in personnel training, facilities, and materials which may result in economic and cognitive barriers (e.g., Lavie, 2006). The failure of accounting for the costs of implementing appropriate global integration mechanisms may lead to additional investments in coordination mechanisms that deteriorate the performance of the activity (e.g., Srikanth and Puranam, 2009). The offshored activity may also require substantially more communication and knowledge transfer between home and host location due to unexpected cultural differences which make the organization more inert and less responsive (Kumar *et al.*, 2009).

Thus, the opportunity costs of reconfiguration cost estimation errors negatively influence the process performance of the activity. The operations of the activity are likely to be disrupted by managerial responses of the reconfiguration cost estimation errors. Rather than allocating resources to the facilitation of the operations of the activity, resources are instead used for accommodating the reconfiguration cost estimation error. Indeed, Lavie (2006) argue that major risks of reconfiguration costs include unsuitable response to technological change, unsuccessful integration, and undetected technological change. As a consequence, reconfiguration cost estimation errors will likely make the operations of the activity less prioritized, and this will have a negative impact on the process performance of that activity. The following hypothesis can therefore be formulated:

***Hypothesis 1:** A higher degree of offshoring implementation cost estimation errors is likely to have a negative effect on the process performance of the activity.*

The moderating role of modularity

The foregoing argument suggests that the process performance of the offshored activity is negatively affected by situations where decision makers systematically underestimate the costs of reconfiguration. However, it is also plausible to expect that firms can experience positive process performance despite estimation errors. For example, a firm may discover that while an offshoring decision was initially driven by cost-reducing objectives, the implementation may turn out to give access to new resources, knowledge and markets. Hence, it is assumed that the relationship between firms' cost estimation ability and offshoring process performance is positively moderated by factors that explain why some offshoring implementations display

increased performance despite cost estimation errors. In particular, this paper focuses on the organizational design of offshoring, and, specifically, the role of modularity in the activities.

Prior research argues that hidden costs and cost estimation errors can largely be explained by the degree of organizational complexity in the firm and its impact on the ability of the decision maker to rationally account for all important decision factors (Larsen *et al.*, 2012). A growing number of ‘non-simple’ interdependencies (Simon, 1962) to coordinate joint action increase the likelihood for decision errors (Levinthal, 1997). In respect of offshoring, a consequence of relocating organizational tasks to foreign locations is the increased need for international coordination (Kumar *et al.*, 2009; Srikanth and Puranam, 2011). An organization with only domestically located activities can to a larger extent rely on informal and tacit coordination mechanisms, where project teams find it easier to build collegial environments and common ground due to rich communication and shared contexts (Allen, 1997; Storper and Venables 2004). As firms begin to relocate and disperse activities abroad, the act of coordination becomes more challenging and costly as firms need to ensure that the growing numbers of international interdependent activities are coordinated and contribute to joint organizational action (Srikanth and Puranam, 2011). Cost estimation errors occur as bounded rational decision makers are not able to foresee and estimate the consequences of relocating an offshoring activity in a foreign location (cf., Simon, 1955). In order to understand factors that moderate the relationship between cost estimation errors and the activity’s process performance, it is therefore necessary to investigate how firms can manage the complexity of offshoring.

In this respect, the organizing principle of modularity becomes important. Modularity describes structures (products, production systems and organizations) based on minimized and standardized interactions and interdependencies between units (Baldwin and Clark, 2000; Ethiraj

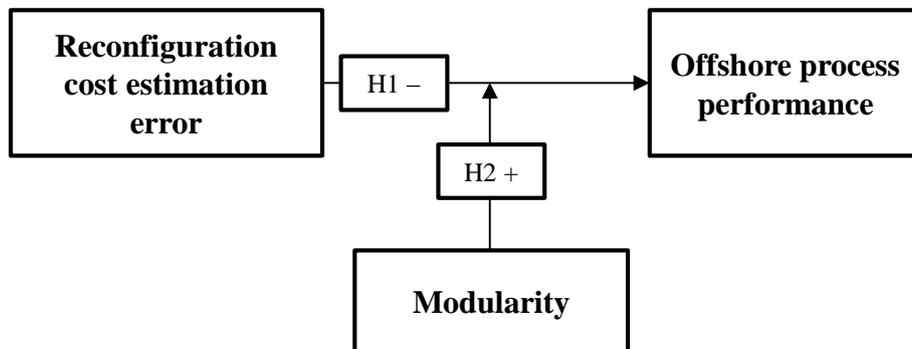
and Levinthal, 2004b; Sanchez and Mahoney 1996). By carefully specifying, standardizing and enforcing the interfaces of interdependent organizational activities, modularity intentionally reduces the need for costly coordination as it entails hierarchies with property of near-decomposability that simplifies their behavior (see Simon, 1962). In the case of offshoring, modularity can be seen as a mechanism that counters and reduces the increased need for coordination when relocating organizational activities abroad (Mithas and Whitaker, 2007; Srikanth and Puranam, 2011). Since the opportunities for informal face-to-face coordination is undermined when moving an activity abroad, firms benefit from using the coordination principles of modularity that promote structures with pre-specified interdependencies that are not subject to continuous negotiation. Firms can more easily decouple and disintegrate modular activities (Sanchez and Mahoney 1996) and subsequently relocate these to foreign locations.

Thus, assuming the increased complexity of coordinating an offshoring organization can lead to cost estimation failures (Larsen *et al.*, 2012), the extent to which the activities that are relocated offshore are modularized—i.e., the interdependencies specified and standardized—should positively moderate the negative relationship between cost estimation errors and process performance. By more easily facilitating aspects such as organizational reintegration, knowledge transfer, and effective division of labor between the domestic and foreign activities, the negative impact of reconfiguration cost estimation errors is undermined. These arguments lead to the following hypothesis:

Hypothesis 2: *The degree of modularity in the offshored activities has a positive moderating effect on the relationship between reconfiguration cost estimation errors and process performance of the activity.*

In sum, the foregoing hypotheses form a theoretical model suggesting that cost estimation errors have a negative impact on the process performance of the activity being offshored, but that this is positively moderated by the modularity of the activity. This model is illustrated in Figure 3.1.

Figure 3.1 – Theoretical model



3.3 RESEARCH METHODOLOGY

Sample and survey design

The purpose of this paper is to investigate the offshoring process performance consequences of cost estimation errors and the moderating role of modularity. The hypotheses are tested on a dataset based on the Global Operation Network (GONe) survey. The survey collects data on Danish and Swedish companies, and focuses on the process of relocating activities from Denmark and Sweden to foreign locations. It targets the latest offshoring implementation in the respective firms. As the process of offshoring challenges firms' ability to coordinate a globally concerted organization (Kumar *et al.*, 2009; Srikanth and Puranam, 2011), the purpose of the survey is to unravel the organizational consequences of offshoring on issues such as different

organizational mechanisms that firms employ to manage their offshoring activities, performance implications and capability development.

The population of the study consists of all Danish firms across industries with more than 50 employees (2,908 companies) and all Swedish manufacturing firms with more than 50 employees (1,549 companies). The survey was conducted among these 4,457 companies in the time period from September 2011 to January 2012, where the CEOs of the companies were per postal mail and e-mail invited to participate in an online survey. In the survey, the respondents were asked about the characteristics of the offshoring implementations, the coordination of the offshoring activities, the interdependencies between domestic and offshored activities, and the effects of offshoring the activities. All in all, 1,086 usable questionnaires were received, which represents a response rate of 24.4%. Out of these, 379 companies (34.9%) reported that they have experience with offshoring.

The sample used for this study consists of data on specific offshoring implementation from 221 companies (161 Danish companies; 60 Swedish companies) across different functions and industries (smaller sample due to different missing values). 62.0% of the implementations are captive offshoring and 38.0% are offshore outsourcing. 64.4% of the implementations are production tasks (e.g., fabrication, assembly, and maintenance), 21.9% are service tasks (e.g., finance, marketing and sales, IT and call centers), and 13.7% are R&D tasks (e.g., product design, product development, and software development). The firms are based in different industries, primarily manufacturing (34.2%), wholesale (15.2%), information and communication technology (11.4%), and finance and insurance (8.9%). 26.7% are small (< 150 employees), 29.4% medium (< 500 employees), and 43.9% large (\geq 500 employees). These firms

offshore to 43 different countries, where China (21.4%), India (11.0%) and Poland (9.9%) are the most frequently used locations.

Variable construction

Dependent variable

The dependent variable in this study is the *process performance* of the activity that is relocated to an offshore location. This variable is inspired by previous research that investigates how the implementation has created a positive impact on an activity being relocated to a foreign location (e.g., Scott, 2005; Srikanth and Puranam, 2011). For example, Srikanth and Puranam (2011) measure process performance by composing an aggregate construct of following four items: 1) cost savings; 2) service quality improvements; 3) rapid growth; and 4) satisfaction with service. In a similar vein, process performance is in this paper measured using the average of five survey items in which respondent are asked to indicate on a 7-point Likert scale (1 = worse; 4 = no changes; 7 = better) the general effect of the activity post offshoring implementation. The five items are: 1) flexibility; 2) quality; and 3) productivity 4) profitability; and 5) costs demand.² These items produce a single construct with a Cronbach alpha $\alpha = 0.77$.

Independent variable

The independent variable is *cost estimation errors* of implementing an offshoring activity abroad and follows previous research that investigates hidden costs (Larsen *et al.*, 2012) and firms' forecasting ability (Durand, 2003; Makadok and Walker, 2000). The variable is measured by

² It should be noted that the performance items in this paper are perceptual measures. While these may be biased, perceptual measures of performance have been widely used in strategic management literature and most studies find high convergent validity with objective measures such as publicly available accounting data (e.g. Powell and Dent-Micallef, 1997; Hart and Banbury, 1994; Dess and Robinson, 1984; Venkatraman and Ramanujam, 1987).

asking respondents on a 7-point Likert scale about the extent to which the decision maker was at the point of decision-making able to foresee the costs of implementing the offshoring activity in the light of the realized costs of offshoring ex post implementation (1=actual cost levels lower than expectations; 4=actual cost levels meet expectations; 7=actual costs levels higher than expectations). The higher the value of variable, the higher is the degree to which the decision maker wrongly estimates the cost of implementing an offshoring decision. As such, as the variable is intended to capture variations in the extent to which firms can estimate the costs of an organizational reconfiguration when implementing an offshoring activity abroad.

Moderating variable

The moderating variable is *modularity* and is intended to capture how firms reduce the need for costly coordination across distance through the standardization and minimization of task interdependencies (Baldwin and Clark, 2000; Sanchez and Mahoney, 1996). The variable is measured using the average of five survey items inspired by previous operationalizations of modularity (e.g., Srikanth and Puranam, 2011; Worren *et al.*, 2002). These are the degree to which the offshoring task is 1) specified with the purpose of easing coordination; 2) defined through overarching goals and guidelines; 3) the interfaces are defined through procedures, manuals and blueprints; 4) integrated with remaining activities at home (inversed item); and 5) coordinated based on formalization. For each of these items, respondents answer on a 7-point Likert scale (1=nothing; 7=to a large extent). The five items produce a single construct with a Cronbach alpha $\alpha = 0.72$. The questions used to measure the key constructs are summarized in Table 3.2.

Table 3.2 – Operationalization of key theoretical constructs

<i>Dependent variable</i>	<p>Process performance post offshoring ($\alpha = 0.77$) Please indicate on a 7-point Likert scale (1 = worse; 4 = no changes; 7 = better) the general effect of the offshoring activity post implementation regarding:</p> <ol style="list-style-type: none"> 1) Flexibility 2) Quality 3) Productivity 4) Profitability 5) Costs demand
<i>Independent variable</i>	<p>Cost estimation errors Please indicate the degree to which you were able to foresee the costs of implementing the offshoring activity in the light of the realized costs of offshoring ex post implementation (1=actual cost levels lower than expectations; 4=actual cost levels meet expectations; 7=actual costs levels higher than expectations).</p>
<i>Moderating variable</i>	<p>Modularity ($\alpha = 0.72$) For each of these items, please indicate on a 7-point Likert scale (1=nothing; 7=to a large extent) the degree to which the offshoring task is:</p> <ol style="list-style-type: none"> 1) Specified with the purpose of easing coordination 2) Defined through overarching goals and guidelines 3) Defined through procedures, manuals and blueprints 4) Integrated with remaining activities at home (inversed item) 5) Coordinated based on formalization

Control variables

Lastly, a number of variables have been included to control for unobserved heterogeneity and alternative explanations. First, the *governance mode* of the implementation is measured as a dummy (1 = captive offshoring, 0 = offshore outsourcing). Second, the type of offshoring activity is measured as dummy variables. These are *production* and *service* (a third possible type R&D was omitted and therefore serves as the baseline when interpreting the coefficients of production and service). Third, a dummy variable captures whether the company is a *manufacturing* or a service company (1 = manufacturing; 0 = service). Fourth, the *size of the*

offshoring implementation is measured as the logarithm of the number of employees that are employed at the implementation. Fifth, the *size of the offshoring company* is measured as the logarithm of the total number of employees that are employed at the company. Sixth, since performance may change over time, the *maturity* of the offshoring implementation is measured as the logarithm of the time in years since the activity was implemented. Seventh, the offshoring *experience* of the company is measured as the logarithm of the difference in the number of years since the first offshoring implementation in the company and the respective offshoring implementation. Eighth, since research has pointed out that offshoring decisions supported by a corporate strategy generally perform better (Massini *et al.*, 2011), the presence of a *corporate strategy* in the offshoring strategy is measured as a dummy (1 = yes; 0 = no). Ninth, the region where the offshoring implementation is location is controlled for by creating a dummy for each region. Finally, the firms' *home country* is captured by a dummy variable (1 = Denmark; 0 = Sweden).

Econometric specifications

The statistical analysis is conducted on the level of the 221 offshoring implementations. A hierarchical regression analysis with successive linear regression (OLS) models each adding more explanatory variables is used to measure the dependent variables process performance. The hierarchical feature refers to the gradual building of separate, but related, models with added explanatory variables. In each step, an F-test for increment is conducted in order to test whether a significant improvement in the explanatory power has been gained. To reduce problems of multicollinearity inherent in moderator models, the independent and moderating variables have been centered and standardized. Moreover, to avoid problems of heteroscedasticity, the analyses

are conducted with robust standard errors. Lastly, the failure to find significant results in a skewness/kurtosis test suggests that the assumption of normality of the error term is not violated.

3.4 RESULTS

Descriptive statistics

The descriptive data (mean values, standard deviation, minimum and maximum values) and correlation matrix are reported in Table 3.3.

As can be seen, there is considerable variation in the key variables: process performance, cost estimation error, and modularity. The implementations also vary in terms of size, maturity and experience. A closer inspection of the correlation matrix shows a low correlation between most variables. Hence, the dataset does not seem to involve problems of multicollinearity. When looking at cost estimation error, 11.7% reported that realized costs were lower than expected costs, 60.6% reported that realized costs met expected costs, and 27.7% reported realized costs were higher than expected costs. All observations are used in the analysis to capture the variation in the relative degree of cost estimation errors. However, as this variable is centered and standardized, the descriptive statistics show a mean of 0 and standard deviation of 1. The average company has 5,859 employees on a world basis and the average implementation has 63 employees.

Table 3.3 – Correlation matrix and descriptive statistics (n=221; region dummies are excluded)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Process performance	1.00													
2 Cost est. error	-0.30*	1.00												
3 Modularity	0.13	0.06	1.00											
4 Est. error * modularity	0.16*	0.11	0.35*	1.00										
5 Production	0.10	-0.06	0.06	0.03	1.00									
6 Service	-0.11	0.03	0.07	-0.08	-0.70*	1.00								
7 Impl.year	0.07	0.09	0.06	0.04	-0.03	0.10	1.00							
8 Corp. strat.	0.11	0.00	0.11	0.01	0.07	0.05	-0.10	1.00						
9 Exper.	0.02	-0.08	-0.03	0.08	0.11	-0.12	-0.39*	0.02	1.00					
10 Captive	0.01	0.07	0.02	0.12	0.13	0.01	0.07	0.08	0.14*	1.00				
11 Home country	0.14*	-0.11	-0.16*	-0.01	-0.31*	0.22*	-0.09	0.08	-0.10	-0.06	1.00			
12 Impl. size	0.17*	-0.01	0.09	-0.04	0.13	-0.11	0.17*	0.16*	0.06	0.27*	-0.08	1.00		
13 Manufacturing	-0.11	0.01	-0.02	0.00	0.50*	-0.33*	-0.01	0.05	0.18*	0.14*	-0.46*	0.06	1.00	
14 Comp. size	-0.07	0.01	0.15*	-0.12	-0.25*	0.27*	-0.05	0.05	0.20*	0.16*	-0.02	0.32*	-0.16*	1.00
Mean	4.91	0.00	0.00	0.06	0.64	0.22	1.30	0.56	1.41	0.62	0.73	2.81	0.63	6.37
Std. Dev.	0.98	1.00	1.00	1.19	0.48	0.41	0.65	0.50	1.19	0.49	0.45	1.44	0.48	1.95
Min.	2.00	-3.31	-3.35	-6.20	0.00	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.00	3.40
Max.	7.00	2.88	3.11	8.96	1.00	1.00	3.26	1.00	3.50	1.00	1.00	8.52	1.00	12.52

* indicate significance levels at 5%.

Hypotheses testing

The results of the OLS models are reported in Table 3.4. In all models for process performance (Model 1-3), cost estimation error is negative and significant as expected ($\beta = -0.27; 0.27; 0.28, p < 0.001$). This provides support to Hypothesis 1, suggesting that a higher degree of cost estimation errors has a negative impact on the process performance of the offshored activity.

Table 3.4 – Hierarchical regression models with offshore process performance as dependent variables (n=221)

Variables	Offshore process performance		
	Model 1	Model 2	Model 3
Cost est. error	-0.27*** (0.07)	-0.27*** (0.07)	-0.28*** (0.06)
Modularity		0.16* (0.07)	0.10 (0.08)
Est. error * modularity			0.12* (0.06)
Production	0.13 (0.19)	0.06 (0.19)	0.11 (0.19)
Service	-0.16 (0.22)	-0.21 (0.22)	-0.13 (0.23)
Captive	-0.05 (0.14)	-0.04 (0.14)	-0.08 (0.14)
Corp. strat.	0.24† (0.13)	0.20 (0.13)	0.19 (0.13)
Impl.year	0.19† (0.11)	0.18 (0.11)	0.17 (0.11)
Exper.	0.07 (0.06)	0.07 (0.06)	0.05 (0.06)
Impl. size	0.12* (0.05)	0.11* (0.05)	0.12* (0.05)
Comp. size	-0.05 (0.04)	-0.07† (0.04)	-0.05 (0.04)
Manufacturing	-0.33* (0.16)	-0.28† (0.16)	-0.28† (0.16)
Home country	0.16 (0.17)	0.25 (0.17)	0.22 (0.17)
China	-0.18 (0.22)	-0.16 (0.21)	-0.14 (0.21)
India	-0.34 (0.30)	-0.35 (0.30)	-0.31 (0.30)
Poland	0.21 (0.22)	0.20 (0.22)	0.21 (0.22)
Asia	0.10 (0.24)	0.06 (0.23)	0.11 (0.22)
West Europe	-0.03 (0.24)	-0.06 (0.24)	-0.13 (0.24)
East Europe	0.03 (0.21)	0.11 (0.21)	0.10 (0.21)
Other regions	0.25 (0.29)	0.22 (0.28)	0.26 (0.28)
Intercept	4.53*** (0.40)	4.61*** (0.41)	4.52*** (0.41)
F-values	3.07***	4.01***	5.37***
R-square	0.214	0.236	0.250
F-test for increment		5.90*	3.86†

†, *, ** and *** indicate a significance level of 10%, 5%, 1% and 0.1%, respectively.
Robust standard errors reported in parentheses.

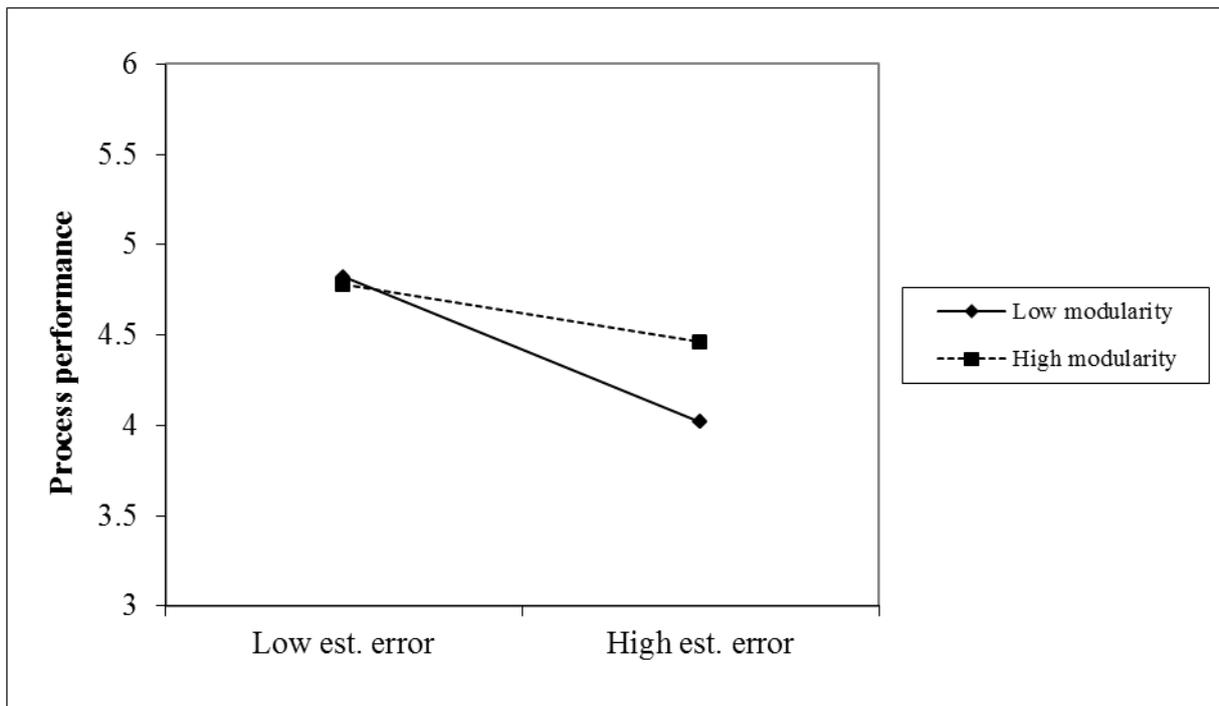
In order to test Hypothesis 2, the full model is used to see the effect of the interaction term. First, Model 1 with only the independent and control variables obtains an R-square of 0.214. In order to test for the impact of the moderating variable, modularity is added in Model 2. Modularity is positive and significant ($\beta=0.16$, $p < 0.05$), which suggests that it has a positive direct effect on the process performance of the offshored activity. Moreover, the R-square in Model 2 increases significantly to 0.236 compared to Model 1 (F-value for increment=5.90, $p < 0.05$), suggesting that the explanatory power of the model with modularity is significantly higher than without modularity.

In order to investigate the impact of the interaction term, the results of the full model with all variables are presented in Model 3. Here, the interaction term is positive and significant ($\beta=0.12$, $p < 0.05$), while the moderating variable modularity turns out insignificant. Moreover, the R-square shows a slightly significant increase to 0.250 compared to Model 2 (F-value for increment=3.86, $p < 0.10$). Thus, the full model with the interaction terms explains a fourth of the total variation in the dependent variable cost estimation errors, and is therefore according to the goodness-of-fit statistics (F-value, R-square, F-test for increment) superior to the other models in explaining process performance. Modularity is thus moderating the effect of cost estimation errors on process performance. These results are further illustrated in Figure 3.2, where the two-way interaction between estimation error and modularity on process performance is depicted.

Interestingly, in cases with low estimation error, it seems that low modularity obtains slightly higher performance than high modularity. However, as cost estimation errors increase, the performance benefit of high modularity rapidly surpasses low modularity. Thus, in cases of high estimation errors, high modularity obtains higher internal performance than low modularity. Moreover, it should be noted that although high modularity has a positive moderating effect, the

slope is still negative, but significantly less so than with low modularity. Thus, the moderation of modularity does not increase internal performance per se, but rather reduces the negative impact of cost estimation errors on performance.

Figure 3.2 – Two-way interaction on process performance



Among the control variables in the full model, only two come out with significant coefficients. These are: implementation size ($\beta=0.12$, $p < 0.05$) and manufacturing ($\beta=-0.28$, $p < 0.10$). This suggests that larger implementations (measured in terms of employees) in general display higher performance, and that firms in manufacturing industries (compared to service industries) have lower performance. Also, none of the region dummy variables turn out significant in the final model. In sum, the data suggest that reconfiguration cost estimation errors have a negative effect on the process performance of the offshored activity (Hypothesis 1), but

that this relationship is positively moderated by the degree of modularity in the activity (Hypothesis 2).

In order to test the robustness of the findings, a number of measures have been taken. First, in order to investigate whether cost estimation errors could be an endogenous choice variable that is correlated with unobservables relegated to the error term, a two-stage instrument variable approach has been conducted (Reeb *et al.*, 2012). In the first stage, a model was run with cost estimation error as a function of the choice of location of the offshoring implementation (dummy variables indicating whether the activity was located in Asia and Western Europe) that was uncorrelated with the dependent variable but correlated with the cost estimation error (Stock *et al.*, 2002). In the second stage, the residuals of the model in the first stage were included as a control variable in a full model of offshoring performance. The residuals turned out insignificant on process performance and an F-test to see whether the residuals were significantly different from zero also turned out insignificant ($F = 0.11$) (Sargan, 1958). This therefore suggests that cost estimation error is not suffering from endogeneity.

Second, common method bias where the dependent and the independent variable stem from the same source is a substantial problem for cross-sectional studies like the present (Chang *et al.*, 2010). Several measures were taken to investigate whether the present study suffers from common method bias. First, the complexity of model, particularly with the moderating variable, makes common method biases less of a problem (Harrison *et al.* 1996). Second, a Harman one-factor test was conducted to see whether the majority of the covariance can be explained by a single factor (Podsakoff and Organ, 1986). Using all the items of the model in the factor analysis, four factors with an eigenvalue greater than 1 emerged explaining between 26.4% and 9.9% of the total variance. This indicates that the diversity of facets captured by the model

constructs makes it unlikely that a single factor explains all the covariance in the constructs. Third, a ‘marker variable’—a theoretically unrelated variable to the constructs of interest—as a proxy for common method variance has been investigated (Lindell and Whitney, 2001). A variable indicating whether the offshoring activity can only be conducted by personnel with a higher education was used for this purpose. Only marginal and non-significant correlations between the constructs of interest and the marker variable was found (process performance = 0.04; cost estimation error = 0.02; modularity = -0.05; cost estimation error*modularity = 0.01). All in all, this suggests that the results are not contaminated by a common method bias.

3.5 DISCUSSION

As firms implement strategic decisions, important estimations on the costs of the organizational changes must be made (Durand, 2003; Eisenhardt and Martin, 2000; Makadok and Walker, 2000). Often, however, firms experience that factors such as complexity, biases and politics make the implementation of the strategic decisions more costly than expected (Dibbern *et al.*, 2008; Larsen *et al.*, 2012; Stringfellow *et al.*, 2008). In the context of offshoring, this paper argues that these *reconfiguration cost estimation errors* have detrimental consequences for the process performance of a given activity that is relocated abroad, but that this relationship is mitigated by the degree of modularity in the activity. Decision makers’ inability to effectively estimate the costs of reconfiguration by implementation an activity in a foreign location results in opportunity costs that negatively impact the process performance of the activity. Operations are likely to be disrupted by factors such as unexpected additional resources used to train and educate the local labor and the implementation of inappropriate global integration and communication mechanisms. At the same time, assuming that complexity and the increased need

for coordination are important sources of cost estimation failures, firms that offshore modularized activities requiring less coordination are likely to experience a positive moderating effect on performance.

Data on 221 offshoring implementations reported by Danish and Swedish firms support these arguments. The results suggest that cost estimation error has a negative impact on process performance of the offshored activity (Hypothesis 1) and that modularity has positive moderating effect on this relationship (Hypothesis 2).

This study has important implications for research on the costs and performance of offshoring in particular, and for the role and consequences of decision-making in strategic management research in more general. Recent offshoring research investigates different factors that may explain variations in offshoring performance, such as the role of corporate strategies (Massini *et al.*, 2010) and learning (Jensen, 2009; Maskell *et al.*, 2007). This research adds to the literature by showing that the inability to estimate the costs of reconfiguration has a negative effect on the process performance of the activity that is being implemented abroad. In this respect, the cost estimation errors in decision making processes are critical to the extent that they result in lower process performance of a given activity, and as such can be a source of situations in which ‘hidden costs’ undermine the initial rationale for offshoring firm activities abroad (Dibbern *et al.*, 2008; Larsen *et al.*, 2012; Stringfellow *et al.*, 2008). Evidence of offshoring failures and back-sourcing lends support to this argument (Chadee and Raman, 2009; Frauenheim, 2003). As companies expand the scale and scope of offshoring, many firms realize that managing an increasingly globally dispersed organization is more difficult and costly than initially expected. However, while previous research has explained hidden costs through measures such as complexity (Larsen *et al.*, 2012) and interaction intensity and distance

(Stringfellow *et al.*, 2008), this paper advances this debate by theoretically and empirically pinpointing the detrimental performance consequences of hidden costs (seen as cost estimation errors), and how modularity can positively moderate this relationship. Future research could therefore investigate the nature of different types of hidden offshoring costs, such as knowledge transfer, control and design (cf., Dibbern *et al.*, 2008), and test how these impact performance individually. Moreover, future research could investigate the moderating role of costly investments in new offshoring coordination mechanisms and how this impact performance. This is important as it offers a perspective on the potential detrimental relationship between strategic decision-making and performance.

Moreover, by stressing the organizational reconfiguration of offshoring and particularly the impact of new and international interdependencies between the spatially differentiated activities, this research suggests that the modularity of the offshored activities has a positive moderating effect on the relationship between cost estimation errors and process performance. Given the impact of complexity on estimation errors (Larsen *et al.*, 2012), firms that reduces the need for coordination through modularity in the reconfiguration process will experience that the process performance is positively moderated. These results emphasize the importance of aligning firms' coordination mechanism to the new organizational demands (Srikanth and Puranam, 2011). However, while this research found modularity to positively moderate performance, future research could investigate other coordination mechanisms such as ongoing communication and IT-based coordination. Moreover, bounded rational decision makers may not grasp how the implementation of a strategic decision may impact new organizational demands (Ethiraj *et al.*, 2005). It is thus important to investigate how planned interdependency management (prior to the

implementation) versus emerging management (after the implementation) impact performance (see Manning *et al.*, 2012).

More generally, this research contributes to research on firms' estimation abilities (Durand, 2003; Makadok and Walker, 2000) and strategic decision-making effectiveness (Dean and Sharfman, 1996). Besides adding to a broader debate on the causal relationship between firm capabilities and performance (e.g., Ethiraj *et al.*, 2005; Henderson and Cockburn, 1994), this paper stresses the importance of effectively estimating future costs of implementing strategic decisions. This is of high importance in strategic management as it determines future resource allocations to the pace of anticipated changes in the organization and the environment, and, as such, is a significant determinant for performance (Eisenhardt and Martin, 2000). However, in contrast to similar research investigating forecasting in external environments, such as market and industry growth (e.g., Durand, 2003; Makadok and Walker, 2000), this research emphasizes the importance of estimating the costs of internal organizational change. This means that firms' ability to foresee the costs and consequences of organizational change with a particular focus on the role of interdependencies and coordination is important to understand performance deviations. Initial cost estimations are likely to set expectations in the implementation process, and, as such, allocate and utilize resources in a most efficient manner. Future research could therefore put more emphasis on understanding the relationship between decision-making processes, the impact of the organizational design, and performance. In particular, questions relating to understanding the different factors that ensure more or less effective strategic decision-making (measured by fulfillment of strategic objectives, see Dean and Sharfman, 1996) provide valuable grounds for future research. For example, a qualitative research study

investigating an entire offshoring process—from decision-making through implementation to performance consequences—would be particularly well equipped to investigate topics like these.

Limitations and future research

Due to the nature of the data, reconfiguration cost estimation errors—operationalized as deviations between expected and realized costs of implementation—have been measured at a single point in time after the offshoring implementation. Asking retrospectively about initial expectations may lead to an underestimation of cost estimation errors (although the results still hold despite the conservative bias of the independent variable). Moreover, there is a theoretical time lag between cost estimation errors and performance that the data in this study do not capture. For example, the performance of the strategic decision may only materialize after a certain point of implementation maturity (that is not necessarily linear). Although the maturity of the project is controlled for, future research could pay more attention to how different time frames resonate with performance. In particular, future research could endeavor to collect data on expectations and actual costs of implementation before and after the offshoring implementation as well as subsequent performance data. This would have obvious advantages to the design used in this paper.

Moreover, this paper relies dominantly on survey data. As such, this study is not able to scrutinize the actual decision-making process leading up to offshoring implementation. Also, the data does not allow for an investigation of the actual implementation of the offshoring activity. Future research could therefore more carefully address how this process actually develops, the various factors contributing to the success of decision-making, and how this resonates with performance. An in-depth qualitative case study would have obvious advantages in this respect.

Lastly, while this research has investigated the moderating role of modularity on process performance, it has left out an important discussion and empirical investigation on the impact of location. For example, it can be assumed that environmental uncertainty should have a negative moderating role on the relationship between cost estimation errors and process performance. Previous studies show how foreign market entry mode choices and the effectiveness of these largely depend on the target country's environmental uncertainty (Slangen and van Tulder, 2009). As decision makers make important estimations regarding environmental factors when deciding to engage in offshoring, such as such as labor and resource cost inflation, exchange rate fluctuation, tax policies, etc., increased perceived environmental uncertainty would make it more difficult for the decision maker to effectively estimate the impact of these environmental factors. Following the logic of this paper, it can be assumed that the ability of firms to effectively coordinate and manage external factors such as the political environment (Oliver and Holzinger, 2008) should have an important influence on the relationship between cost estimation errors and process performance. Accordingly, future research could investigate other factors that moderate performance as a result of cost estimation errors.

Concluding remarks

This paper investigates the relationship between cost estimation errors, modularity and offshore process performance, and as such contributes to an important discussion on the effectiveness of strategic decision-making. In particular, this paper argues that reconfiguration costs estimation errors create opportunity costs with detrimental process performance consequences, but that this is positively moderated by modularity. While this paper found the context of offshoring to be particularly beneficial for this purpose, especially as the phenomenon points to central added

complexities and challenges of managing global enterprises (Kumar *et al.*, 2009, Srikanth and Puranam, 2011), the relationship between firms' estimation abilities, organizational design and performance needs to be further explored in other contexts.

Chapter 4

Organizational reconfiguration and strategic response: The case of offshoring

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Abstract: The purpose of this paper is to investigate the effect of the organizational reconfiguration of offshoring on firms' strategies. A consequence of offshoring is the need to reintegrate the geographically relocated organizational activities into a coherent organizational architecture. In order to do this, firms need a high degree of architectural knowledge which is typically gained through learning by doing. We therefore argue that firms with more offshoring experience are more likely to include organizational objectives in their offshoring strategies. We develop and find support for this hypothesis using a mixed-method approach based on a qualitative case study and comprehensive data from the Offshoring Research Network. These findings contribute to research on the organizational design and architecture of offshoring and the dynamics of organizational architectures.

Keywords: offshoring, strategic response, architectural knowledge, mixed-method approach.

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4.1 INTRODUCTION

How does the organizational reconfiguration of offshoring influence firms' strategies? In recent years, the practice of offshoring administrative and technical services to foreign locations has gained vast popularity. Firms are not only offshoring standardized IT and business processes, but also more complex and knowledge-intensive activities such as product design and development (Kenney *et al.*, 2009; Lewin *et al.*, 2009). However, while much research has provided rich insights into questions such as which functions firms decide to offshore, which governance modes they choose, where they offshore to, and what outcomes they achieve (e.g., Doh *et al.*, 2009; Lewin *et al.*, 2009; Mol *et al.*, 2005), less research has been devoted to understanding the dynamics of offshoring (Contractor *et al.*, 2010; Maskell *et al.*, 2007; Kedia and Mukherjee, 2009). In particular, little research has questioned how firms realize strategies of offshoring. Our paper contributes to filling this gap by studying firms' strategies following the offshoring implementation.

When firms implement offshoring activities abroad, they initiate an organizational reconfiguration where they relocate disaggregated organizational activities abroad to either independent suppliers, to wholly-owned subsidiaries or in joint-ventures (Bunyaratavej *et al.*, 2011, Contractor *et al.*, 2010, Manning *et al.*, 2008). Although the offshoring decision may provide firms with an array of advantages, such as lower costs, access to new resources, and markets (Dossani and Kenney, 2003; Lewin *et al.*, 2009; Hutzschenreuter *et al.*, 2011b), it also presents firms with substantial challenges. For example, Dell Inc., the U.S. based multinational IT corporation, decided in 2003 after much problems and challenges regarding cultural differences, language difficulties and time delays to eventually close and source back its Indian service centers that it had offshored and outsourced some years earlier (Graf and Mudambi,

2005). Aron and Singh (2005: 135) argue that many firms are caught up by the “*harsh realities of offshoring*” as they fail to pick up the right processes, calculate the operational and structural risks, and match organizational forms to live up to the initial expectations of the offshoring activities.

Since the organizational reconfiguration of offshoring encapsulates new architectural challenges and complexities (Kumar *et al.*, 2008; Srikanth and Puranam, 2011), firms subsequently need to reintegrate the geographically dispersed organizational elements so that they can be supportive of the organizational objectives (Mudambi and Venzin, 2010). In particular, firms need to identify and uncover the new international interdependencies spanning across geographies, cultures and institutions. In this respect, the role of architectural knowledge—knowledge on how different activities are integrated and linked together in a coherent organizational system (Brusoni and Prencipe, 2001; 2006; Henderson and Clark, 1990)—is important. As firms gain experience with the offshoring implementation and thereby accumulate architectural knowledge, decision makers increasingly understand the true nature of the organizational activities and the interdependencies between these, and will therefore acknowledge this in their strategies. Hence, we propose that as firms’ experience with particular offshoring implementations increases they will growingly consider organizational objectives in their strategies.

We develop this idea by employing a mixed-method approach (Edmondson and McManus, 2007). First, we report the findings of an in-depth case study of offshoring in a product development project in Nokia, the worlds’ largest mobile phone manufacturer. The case shows how the decision to offshore was initially driven by locational objectives such as lower costs and access to strategic resources but that this changed over time toward organizational

objectives that could increase organizational performance. We then test and find support for a hypothesis that offshoring experience is positively associated with firms' organizational strategy orientation on comprehensive data from the Offshoring Research Network (ORN).

A contribution of this paper is the emphasis on the role of knowledge accumulation in the offshoring process, where architectural evolution should be understood as an iterative process between decision makers' accumulation of architectural knowledge and the deployment of this in their strategic behavior. This means that strategy follows structure (Chandler, 1962; Hall and Sajas, 1980), but only to the extent that the decision maker successfully accumulates architectural knowledge. Thus, rather than assuming that the effective architecture of firms' offshoring activities can a priori be planned and implemented, we suggest that this is more a subject of learning. The locus of understanding the antecedents of different organizational architectures and their performance contingencies should therefore acknowledge the process in which decisions makers derive architectural knowledge on which decisions are taken.

The paper proceeds as follows: First, we briefly introduce the literature on organizational architectures and the role of architectural knowledge, before we discuss how offshoring may be regarded as an organizational reconfiguration. Second, we present the research methodology, before we introduce the qualitative analysis (based on Nokia) and the quantitative analysis (based on large scale ORN-data). Finally, we conclude the paper by discussing its implications for theory on offshoring and architectural knowledge.

4.2 THEORETICAL BACKGROUND

Organizational architecture and architectural knowledge

An organizational architecture can be defined as decision makers' more or less intentional choices to ensure that organizational components and activities co-exist and are linked to each other in the most effective way (Nadler and Tushman, 1997; Sah and Stiglitz, 1986). According to Sah and Stiglitz (1986: 716), "*The [organizational] architecture describes how the constituent decision-making units are arranged together in a system, how the decision-making authority and ability is distributed within a system, who gathers what information, and who communicates to whom.*" As such, the organizational architecture depicts the architectural decisions on how activities interact, how they are interdependent on one another, and where tasks and organizational boundaries are drawn (Ethiraj and Levinthal, 2004a).

Several different organizational architectures have been identified in the literature. For example, Sah and Stiglitz (1986) distinguish between the polyarchy architecture as a system in which there are several and possibly competing decision makers who can undertake projects or ideas independently of one another, and the hierarchy architectures where only a few individuals undertake projects while others provide support in decision making. Another example is the modular organizational architecture which can be characterized as a loosely coupled organizational form (Orton and Weick, 1990; Weick, 1976) with few and standardized interfaces between different organizational activities (Baldwin and Clark, 2000; Kotabe *et al.*, 2007; Sanchez and Mahoney, 1996). This can be seen in contrast to an integral organizational architecture consisting of a low degree of standardization of interfaces between the different organizational elements (Schilling, 2000; Ulrich, 1995).

Central to the organizational architecture is the underlying interdependency structure. Organizations can be viewed as systems of tasks and individuals that to various extents are interdependent on each other (Grandori, 2001; Lawrence and Lorsch, 1967; Perrow, 1967; Thompson, 1967). Interdependencies link together individual parts of an organization in such a way that the joint outcome of the activities depends on the contributions of these individual parts (Van de Ven *et al.*, 1976). Thus, a purpose of the organizational architecture is to meet the coordination requirements generated by individuals and groups undertaking interdependent activities. An essential role of interdependencies between tasks and individuals is therefore the “*gathering, interpreting and synthesis of information in the context of organizational decision making*” (Tushman and Nadler, 1978: 614) so that coordinated action can be exercised.

In terms of making effective architectural decisions, decision makers thus need to understand the underlying interdependency structure of firms’ organizational architectures. For example, it is well established that the performance of the organizational architectures is highly correlated with the architectural fit (Siggelkow, 2002; Drazin and Ven, 1985, Khandwalla, 1973), i.e., “*an organizational system with no inconsistent core elements and a number of reinforcing core elements*” (Siggelkow, 2002: 128). Architectural fit describes the degree to which the different architectural elements in the organization are consistent with one another and supportive of the organizational objectives. Modular architectural forms can be argued to be superior to integral forms in contexts of high organizational complexity due to standardization and minimization of interdependencies between different activities (Baldwin and Clark, 2000; Kotabe *et al.*, 2007; Sanchez and Mahoney, 1996), whereas it may be less beneficial in contexts with little complexity due to the costs of modularizing a system (Baldwin and Clark, 2003, Brusoni *et al.*, 2007). However, in order to make effective decisions toward achieving fit in

modular systems (e.g., standardize interdependencies), decision makers need to know how changes within the parameters of an existing architecture as well as how broader changes in the architecture itself are geared towards improving organizational performance (Ethiraj and Levinthal, 2004a). For example, decision makers need to know where the organizational boundaries, and hence also interdependencies, are drawn, how change in one activity will influence another activity, and how change in the overarching architecture will impact organizational performance.

Much research has emphasized firms' architectural knowledge—i.e., the understanding of how components in an organizational system are related to each other (e.g., Baldwin and Clark, 2000; Brusoni and Prencipe, 2001; 2006; Henderson and Clark, 1990)—as a crucial factor in taking effective architectural decisions. For example, Brusoni and Prencipe (2006) show how radical organizational evolution in the tire manufacturing industry is strongly mediated by the evolution of firms' engineering knowledge. Indeed, deviations in the performance of organizational architectures have often been associated with the level of architectural knowledge of decision makers (Henderson and Clark, 1990; Baldwin and Clark, 2000; Von Hippel, 1990). Henderson and Clark (1990) refer to architectural knowledge in relation to product technologies as consisting of two parts: knowledge about the different components underlying a distinct system and knowledge about how the components are integrated into an orchestrated systemic whole. The same applies to architectural knowledge in an organizational context: To make effective architectural decisions, decision makers need knowledge about the individual activities and about the ways that the different activities are integrated and linked together in a coherent organizational system. Without knowledge on how the organization with its activities and interdependencies function—i.e., the underlying interdependency structure—there is a higher

risk that incorrect and even deteriorating architectural decisions are taken. Indeed, assuming that decision makers suffer from bounded rationality (Simon, 1955, Simon and March, 1958), the likelihood of making incorrect architectural decision increases with the lack of knowledge.

By contrast, the more knowledge and experience the decision maker have, the more likely it is that effective architectural decisions are taken (Argyres, 2007; Gulati and Puranam, 2009; Jacobides, 2005; Tsoukas, 2001). Through cumulative learning-by-doing over time, firms gain experience with different organizational architectures in different contexts, and more knowledge is gained on what is effective and what is not (Nelson and Winter, 1982; Adler and Clark, 1991). This view is supported by Ethiraj and Levinthal (2004a: 411): “*While bounded rationality suggests that they [decision makers] are unlikely to discover the appropriate structure in the first attempt, it is certainly possible that repeated, small adaptive attempts will generate progress toward the appropriate structure*”. Thus, seeing the effective organizational architectural as the result of a joint discovery process of collective trial-and-error learning (Lounamaa and March, 1987) or as the outcome of firms' successfully managed search for new architectural options and the exploitation of these options once found (Siggelkow, 2002), it is evident that architectural knowledge plays a pivotal role in this process.

The organizational reconfiguration of offshoring

From an architectural perspective, offshoring describes an organizational reconfiguration in which originally co-located activities become relocated abroad in different governance modes (Contractor *et al.*, 2010; Kumar *et al.*, 2009; Srikanth and Puranam, 2011). The organizational architecture is reconfigured on issues such as the contractual ownership and relationship of the offshoring setup (Hutzschenreuter *et al.*, 2011a), the geography of the host location (Graf and

Mudambi, 2005), the interdependencies and coordination mechanisms between the spatially differentiated organizational tasks and activities (Kumar *et al.*, 2009; Srikanth and Puranam, 2011), and the overall coherency of the globally dispersed organizational system (Ernst and Kim, 2002).

In the reconfiguration process, the organizational architecture incurs new complexities by adding distances (e.g., geographical, institutional, and cultural) to the interdependencies between the organizational activities. When activities are co-located, firms may not see the rationale of formalizing coordination mechanisms as day-to-day challenges can be solved in an informal face-to-face manner (Storper and Venables, 2004). However, as activities become dispersed, opportunities for informal coordination are reduced (Allen, 1997) and project teams find it more difficult to build collegial social environments and common ground due to less communication and shared context (Bartlett and Ghoshal, 1989; Clark and Brennan, 1991; Kraut *et al.*, 2002; Martinez and Jarillo, 1989). Moreover, research suggests that firms have a tendency of disaggregating or ‘fine-slicing’ their value chain activities as they engage in offshoring processes (Contractor *et al.*, 2010; Mudambi and Venzin, 2010; Tanriverdi *et al.*, 2007). Consequently, with increased offshoring firms are often presented with a higher number of organizational activities and interdependencies that must be coordinated across distance. In other words, decision makers need to take decisions that can restore fit among the geographically dispersed organizational elements so that they can be supportive of the organizational objectives.

Obviously, the governance mode of the offshoring implementation (captive vs. outsourced) has important implications for the extent to which the decision maker in the offshoring firm are able to implement architectural decisions. For example, it is less likely that a decision maker is able to exercise decision-making authority in outsourced arrangement where

the activity is conducted by an external provider. However, we argue that firms' organizational architecture encapsulates both captive and outsourced implementations by stressing that a central task in offshoring relates to reintegrating offshored organizational activities (irrespective of governance mode) into a value-adding system (Mudambi and Venzin, 2010). The decision-maker possesses control in terms of facilitating the reintegration process and can make important architectural decisions on issues such as how the offshored activities should interact, to what extent they should be interdependent on one another, and where tasks and organizational boundaries should be drawn. In this respect, the offshoring companies presume the role of systems integrators in which they "*lead and coordinate from a technological and organizational viewpoint the work of suppliers involved in the network*" (Brusoni *et al.*, 2001: 613).

Thus far, little research has questioned and investigated how the organizational reconfiguration of offshoring impacts firms' strategies. Indeed, much research has successfully pointed out that firms are driven by offshoring for a number of reasons, such as achieving lower costs, gaining market proximity, and securing strategic resources (Manning *et al.*, 2008; Kedia and Lahiri, 2007). Moreover, research suggests that firms with predefined corporate-wide offshoring strategies that articulate deliberate plans and guidelines for the adoption and implementation of offshoring activities are more likely to generate higher offshoring performance compared to firms that engage in offshoring more opportunistically (e.g., Heijmen *et al.*, 2008; Lewin and Couto, 2007; Massini *et al.*, 2010). However, we know little about the consequences on firms' strategies as they reconfigure their organizations on a global scale. For example, how do firms accommodate for the new complexities in the organizational architecture after relocating activities abroad? Is the successful offshoring implementation only attainable by firms with overarching and supportive corporate strategies? Or, is it also possible that firms

approach offshoring more as a learning-by-doing process? Accordingly, the research question we pose in this paper is: How does the organizational reconfiguration of offshoring influence firms' strategies?

In order to operationalize this research question, we discriminate between two types of offshoring strategies to illustrate how firms' strategies may change as a response to the organizational reconfiguration of offshoring. On the one hand, firms' offshoring strategies can be oriented towards objectives such as new markets, lower production costs, talented labor, etc. Indeed, the main objective for most firms engaging in offshoring is to access labor and other costs in low-cost locations (Lewin and Peeters, 2006). Whether firms offshore knowledge intensive services or more standardized IT activities, a main offshoring objective relates to cutting costs by accessing labor and resources at a comparatively lower cost than in the home-country. We thus label the strategies directed towards achieving benefits derived from the environment as *locational strategy orientation*. This strategy thus captures firms' desire to achieve objectives derived from being present in the host location.

On the other hand, research has also pointed out that firms' offshoring drivers can be devoted toward more organizational objectives. For example, firms may focus on objectives such as reducing systems redundancy, increasing operational and organizational flexibility, improving business process redesign, etc. (Lewin and Peeters, 2006). As such, firms view offshoring as a facilitator for organizational change (e.g., Jensen, 2009). We label these strategies as *organizational strategy orientation*.

4.3 RESEARCH METHODOLOGY

We employ a mixed method approach that combines qualitative and quantitative methodologies (Edmondson and McManus, 2007) to investigate how the organizational reconfiguration of offshoring influences firms' strategies. More specifically, first we employ an inductive analysis of a qualitative case study of the organizational reconfiguration of an offshoring event to accurately examine the phenomenon and eventually derive a testable hypothesis (Eisenhardt, 1989; Yin, 2003; Siggelkow, 2007). This enables us to capture the evolution of the offshoring process; from the offshoring decision to the organizational reconfiguration and further to the strategic response. However, in order to better discuss the generalizability of our finding, we subsequently use quantitative methods on comprehensive survey data to test the hypothesis induced from the qualitative results. Accordingly, we use the two methodological approaches as compliments to explore and explain how the organizational reconfiguration of offshoring influences firms' strategies.

The unit of analysis for both methodological approaches is firms' specific offshoring implementations, defined as relocations of particular tasks or processes to locations outside the home country. Thus, rather than investigating firms' general experience with offshoring, the aim of this study is to study the strategic implications of offshoring a specified firm activity. Hence, we investigate how the added complexities and distances (e.g., geography, institutions, and cultures) to the interdependencies in the organizational architecture (Contractor *et al.*, 2010) affect firms' strategies.

Qualitative data

The qualitative part of this study consists of a case study of an offshoring decision in Nokia Denmark in which certain product development activities were offshored to China. Nokia Denmark was founded in 1996 as a subsidiary of the Nokia Corporation, one of the largest mobile phone manufacturers in the world, and contains the largest Nokia R&D unit outside Finland concentrating on the development of mobile phones. The Danish site houses approximately 1,200 employees, in which 60% are engineers, equally distributed between software and hardware engineers. In 2007, Nokia Denmark received instructions from corporate headquarters to drastically increase the number of mobile phones developed. Motivated by the need to release pressure on its in-house capacity, Nokia Denmark decided to offshore certain product development projects to the Taiwanese company Foxconn in a joint R&D (JRD) setup. Foxconn, one of the world's largest electronic component manufacturers, who was also developing products for many of Nokia's competitors, was given the responsibility of developing and testing selected standardized and less complex mobile phones, while more complex and sophisticated technology projects were retained in Denmark.

The case of Nokia Denmark was theoretically selected for this research (Eisenhard and Graebner, 2007; Pettigrew, 1990) as it highlights a process whereby a firm decides to offshore certain organizational tasks to a foreign location in order to release capacity and reduce costs. It can be argued that this case rather deals with international joint ventures rather than offshoring (e.g., Geringer and Herbert, 1989; Inkpen and Beamish, 1997; Lou, 2002) in which two companies establish a joint architecture for product development. However, since the theoretical motivation of using this case relates to the transfer of product development tasks from Denmark to China, rather than the choice of contractual governance mode, we argue that the case is well

positioned to discuss the organizational reconfiguration of offshoring. Moreover, the case concerns offshoring of a technologically complex process (product development of mobile phones) rather than more standardized activities such as volume production. Accordingly, as the case pinpoints a number of central challenges and complexities of offshoring (Contractor *et al.*, 2011; Srikanth and Puranam, 2011), it is well-positioned to investigate how an organizational reconfiguration influences firm strategy.

We use both archival and interview data to gather longitudinal information of the case, to generate interference, and for triangulation (Silverman, 2006). The archival data consist of published academic cases, academic papers, company reports, industry reports and news articles related to the Nokia Corporation, Nokia Denmark, and Foxconn. The interview data consist of six semi-structured interviews with central JRD stakeholders at Nokia Denmark (head of program management, product development manager, product program manager). Each interview ranged from one to two hours and was conducted in-person by either both authors or one of the authors of this paper. The interviews were used to gain an in-depth picture of offshoring in Nokia, and particularly the evolution of the JRD with Foxconn. Moreover, a number of informal discussions with informants during site visits also served as an important source of data. Since the offshoring process started prior to our involvement in the case, some events relevant to the study had to be captured in retrospect.

Quantitative data

For the quantitative part of this study, we use comprehensive survey data from the Offshoring Research Network (ORN). Accordingly, our study connects to a stream of research utilizing ORN data (Manning *et al.*, 2008, Lewin *et al.*, 2009, Massini *et al.*, 2010). Since its foundation

in 2004, the ORN research team has primarily conducted two major annual surveys based on which offshoring-related data has been collected: the corporate client survey and the service provider survey. Both surveys are utilized for this particular study. The corporate client survey collects data from U.S. firms and European firms on their offshore implementations, including information on tasks offshored, launch year, location choice, choice of delivery model (both captive and outsourced) and performance data. The dataset used for this study consists of data from 129 firms, out of which 73 are U.S. based and 56 are European. These firms reported a total of 353 offshoring implementations. Tasks may include IT infrastructure, administrative services (e.g., HR, legal, finance and accounting), call centers, software and product development, marketing and sales, and procurement. The statistical analysis is conducted on the level of these 353 offshore implementations.

In addition, we also use data from the ORN service provider survey. The service provider survey annually collects a range of firm- and service-specific data from service providers in the U.S., Western and Eastern Europe, India, China, Latin America and other regions. The survey informs about features of services provided (e.g., degree of commoditization), locations from which services are provided, and performance of service delivery. Particularly important for us are control variables measuring the degree of standardization and commoditization of particular services, from the perspective of service providers. Moreover, using data from two independent and unrelated surveys helps us address the common method variance problem (Chang *et al.*, 2010).

4.4 QUALITATIVE ANALYSIS

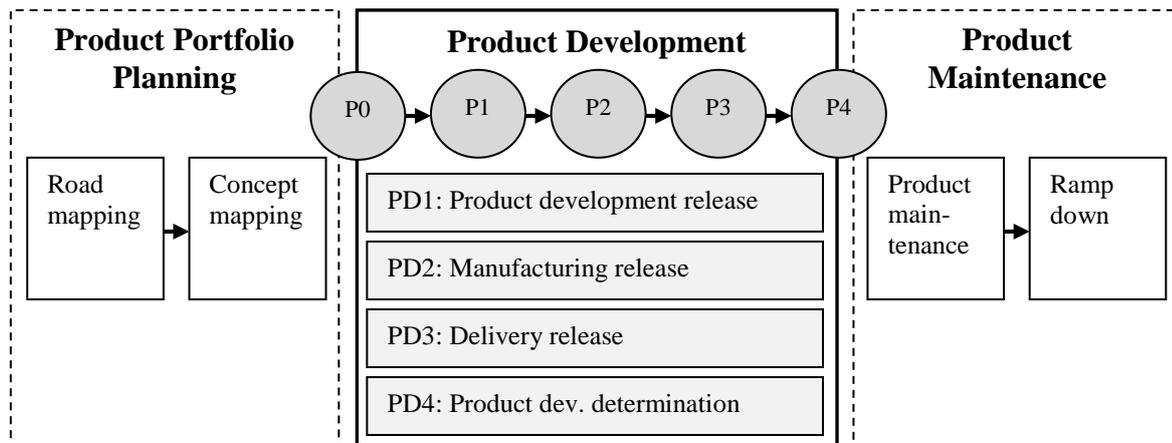
Product Development in Nokia Denmark

The primary activity of Nokia Denmark is the development of new mobile phone models, including every aspect from R&D to sourcing and logistics to marketing and market segmentation. The development of the mobile phone can be divided into the following sub-categories: mechanics, electro-mechanics, electronics and software. In support of these are operations, product validation, quality, display, sourcing and customer care. Together, these groups form the organization of the project development unit in Nokia Denmark in which each team is responsible for optimizing the different technologies and supply chain of the mobile phone. Each year, about six to ten new mobile phones are developed in Denmark. The Danish site is renowned in the global Nokia organization for the many bestselling and path-breaking products and technologies it has developed. For example, the Nokia 3310—one of the most successful Nokia mobile phones with almost 200 million units sold around the world—was developed in Denmark. Moreover, the Series 40 software platform and application user interface software used on Nokia's broad range of mid-tier mobile phones was also developed in Denmark

The organizational architecture of Nokia's product development process describes how different activities located in Denmark follow a generic process with the purpose of developing new products and related process capabilities based on orders from the product and portfolio management (see Figure 4.1). The different activities are organized according to five distinct milestones (PD0 to PD4) that can only be reached if an assigned steering committee approved the development. PD0 marks the initiation of the product program; PD1 the product development release (full functionality of the product); PD2 the manufacturing release (full performance of

the product); PD3 the delivery release (ready for the market); and PD4 the determination of product development (handover to product maintenance).

Figure 4.1 – Nokia product development



The intention of this setup is to funnel and convert ‘good ideas’ into marketable products.

One product development manager explained it as follows:

“Concept mapping is creating a lot of different ideas and finding the ones with most promise; product development is basically maturing what we now have—a concept; and product maintenance is to keep the product alive and integrate different components. We have divided the process into these three parts as each phase requires different competences and mindsets.”

Offshoring to China

In 2007, the management of the Nokia product development unit located in Denmark decided to offshore parts of selected product development projects to the Chinese facilities of Foxconn—a

major multinational electronics components manufacturer—in a joint R&D (JRD) setup. Faced with internal capacity constraints, the Danish Nokia management approached Foxconn with the purpose of cutting costs, reducing time to market, and tapping into Foxconn’s rich pool of technological knowledge. In the JRD setup, Nokia would be responsible for development of the advanced parts of new mobile phones, while Foxconn would be responsible for the development of more standardized parts, such as the molding and fitting of plastic components.

This JRD presented a new situation for the Danish Nokia management. The product development of the mobile phones had traditionally been regarded a core competence at Nokia Denmark, and had previously been carried out in-house. The Nokia management therefore had little experience or knowledge on how to best design and manage a JRD project across vast geographical and cultural distances. According to one Nokia JRD manager:

“It wasn’t a top-down, but a bottom-up decision. The individual development sites were told that they should make X number of products, and then it was up to the local management to find out what we should do. We didn’t have the capacity to make all these products, and our guys couldn’t deliver it. We then found out that we should make some joint R&D.”

Specifically, in the JRD Foxconn presumed responsibility of the product development phase (PD0-PD4) of selected projects (carried out in China) while the product portfolio management and the product maintenance was still done in Denmark (see Figure 4.1). This meant that the entire product development function was reconfigured from being exclusively co-located in Denmark to become dispersed between Denmark and China. An effective

organizational architecture would consequently depend on the extent to which the remaining in-house product development activities in Denmark and the activities outsourced to Foxconn were fully consistent and reinforcing of each other. While the architecture may have been effective while the activities were still co-located in Denmark, the decision to relocate certain activities to China incurred new complexities for the Nokia management in the coordination of the development projects. For example, while the crucial interdependencies between concept mapping and product development release and between product development determination and product maintenance could originally be coordinated through more informal mechanisms such as face-to-face coordination in Denmark, the introduction of the JRD signified that new and alternative mechanisms that could account for the distances.

From a locational to an organizational strategy orientation

Nokia's initial expectations for the JRD had been that they would simply hand the product specification over to Foxconn after the Concept Mapping phase and receive it back for Product Maintenance some months later. The Danish management saw the JRD as a case of simple outsourcing with limited communication with the Foxconn between the ordering and final delivery of the tasks. The attention and strategy was more concerned with the benefits of offshoring to China and Foxconn. Besides the obvious cost-saving motivation of relocating product development capacity to China, Foxconn—as one of the largest companies in the field of electronic component manufacturing—had much relevant knowledge and expertise that Nokia Denmark saw the potential of tapping into. For instance, it had a long history of developing technological products for major contractors around the world and possessed much experience of optimizing product development processes. In addition, Foxconn had supplied electronics

components to Nokia for a number of years prior to the full-scale offshoring decision. Their already established relationship would therefore ease the process of relocating entire product development projects to China.

During the process of implementing the JRD, however, the Nokia management began to face challenges of aligning and reintegrating the two geographically dispersed organizational units. For example, while the Nokia management had hoped that the outsourced activities would be largely self-manageable and requiring minimum intervention from their side, they soon realized that safe-guarding against misinterpretations and misbehavior required substantially more resources than initially expected. Moreover, the increased engagement with Foxconn created internal resistance among Nokia engineers toward relocating PD projects to a supplier and toward teaching a partner how to make Nokia phones. One JRD manager elaborated:

“People in Nokia see it as if we are selling our core competences. On a design level, people have been very nervous and cautious towards the JRD. In the old days, it was rocket science to make good mobile phones. That’s not the case today, however. Everybody can easily buy all the necessary phone components on the market. But if you have made these components internally for the last 20 years, you will think that it is still a core competence for the company.”

Consequently, the Danish management began to experiment with different architectural solutions, such as disaggregating the value chain differently, standardizing the interdependencies and implementing new coordination mechanisms. For example, the Nokia management learned that frequent meetings and monitoring of the tasks were highly necessary to ensure that the

products were developed according to Nokia standards. Among other things, they experienced that they needed to diligently control and coordinate the JRD to ensure the projects' adherence to Nokia's quality standards. They also realized that it was necessary to transfer substantially more knowledge to Foxconn on how the products should be developed. It was only after Nokia Denmark had faced the challenges of aligning technological and organizational specifications between the Danish site and the Chinese site that it began to use weekly video conference meetings.

The realized challenges of offshoring product development to China therefore prompted the Nokia management to align the coordinative task with the requirements of geographically dispersed work. This was particularly increasing the monitoring of the JRD. For example, eight full-time Nokia employees were assigned to follow the JRD from Denmark while the product was being developed by 30 to 50 engineers in China. In order to supervise the life-cycle of the PD projects, Nokia Denmark and Foxconn arranged weekly video conference meetings to discuss the status of each project as well as specific technological and organizational challenges or alterations that might have occurred. Moreover, the two partners also met either in Denmark or in China every six to eight weeks. Nokia also began to experiment with different ways of transferring the required knowledge, such as extensive process codification and frequent coordination. Eventually, the collaboration turned into becoming a Joint R&D rather than just outsourcing of R&D, in which the Nokia management presumed more responsibility regarding integrating the Chinese activities with the remaining Danish activities. Over time, the Nokia management gained knowledge on how the different organizational activities in China and Denmark functioned both individually in the two locations and together in an organizational system, and started to form its strategies on improving the collaboration. Based on this

knowledge, the Nokia management learned how to most appropriately take decisions for the inter-organizational architecture in which better fit between the two dispersed units could be achieved. According to a Nokia JRD manager:

“It’s really learning-by-doing. Nokia is kind of a cowboy company. We plunge into things, muddle our way through and eventually become wiser. It is not that much design in the things we do. We go out and try, and then we adjust”.

Theoretical implications from qualitative study

The findings of this case are to a large extent supportive of much offshoring research that views the offshoring process as a learning-by-doing process (e.g., Jensen, 2009; Manning *et al.*, 2008; Maskell *et al.*, 2007). For instance, Maskell *et al.* (2007) suggest how offshoring to low-cost countries is best described as a learning-by-doing process in which *“over a period of time the outsourcing experience lessens the cognitive limitations of decision-makers as to the advantages that can be achieved through outsourcing in low-cost countries: the in-sourcer/vendor may not only offer cost advantages, but also quality improvement and innovation”* (Maskell *et al.*, 2007: 239). Equally, based on evolving organizational learning in both home and host country firms, Jensen (2009) proposes how offshoring of advanced services should be understood as an antecedent for strategic business development and organizational change.

The uniqueness of the Nokia case relates to how experience is an important antecedent of architectural knowledge. It was only after the Nokia management had gained experience on the collaboration with Foxconn (in China) that they were able to understand the nature of the challenges and thus to take architectural decisions that could improve the effectiveness of the

newly derived organizational architecture. Nokia's experience with the JRD was therefore central in the accumulation of architectural knowledge on the dispersed activities and how they could be integrated and linked into one value-adding system. Thus, as Nokia accumulates architectural knowledge over time, its decision makers increasingly understood the nature of the organizational activities and how these are interdependent on each other.

We therefore induce that firms with low offshoring experience are less likely to have acquired architectural knowledge, and do therefore not have the propensity to include architectural considerations in their offshoring strategies. The firms only have little experience with the implementation, and have therefore not yet been faced with the challenges of reintegrating the international organizational architecture. Without architectural knowledge, the decision maker has no aspiration to consider the organizational architecture, and will therefore devote less attention to (cf., Ocasio, 1997).

With higher offshoring implementation maturity, however, firms are more likely to have been exposed to architectural challenges and thereby gained architectural knowledge. Accordingly, firms are more likely to include organizational objectives in their offshoring strategies with the purpose of increasing organizational performance. Massini *et al.* (2010) find that more experienced firms are more likely to adopt a corporate-wide offshoring strategy with a more nuanced view of offshoring that looks beyond short-term costs advantages, but also includes a broader set of drivers and risks. Similarly, both Maskell *et al.* (2007) and Jensen (2009) show how offshoring experience mediates a sophistication of firms' offshoring operations. Thus, we argue that the more experience a firm has with an offshoring implementation, the more likely it is to have accumulated architectural knowledge, and, as a result, the more likely they are to include organizational objectives in their offshoring strategies.

With architectural knowledge, the decision maker has therefore aspiration to consider the organizational architecture, and will therefore devote more attention on. Based on the Nokia case and the previous reasoning, we formulate the following research hypothesis to be tested on a large-N sample:

Research hypothesis: Offshoring experience has a positive effect on firms' organizational strategy orientation.

4.5 QUANTITATIVE ANALYSIS

Methods and variable construction

Building on the insights of the qualitative analysis, we go a step further by testing the effect of experience on firms' offshoring strategies using data from the Offshoring Research Network (ORN). The variables include a dependent variable—*organizational strategy orientation*—one independent variable—*offshoring experience*—and a number of control variables. For this analysis, we run ordinary least square (OLS) regression analysis. The OLS models are most suitable for this analysis as both our dependent and independent variables are measured on a continuous scale. The operationalization of these variables is outlined in the following.

Organizational strategy orientation is measured by asking respondents to indicate on a 5-point Likert scale about the importance of different strategic drivers (1=not important at all and 5=very important). The three strategic drivers that constitute the organizational strategy orientation variable are: “Enhancing efficiency through business process redesign”, “Enhancing system redundancy” and “Improving service levels”. The three items have a Cronbach Alpha value of 0.64 indicating that they are manifest items of an underlying variable that we label and

interpret as “Organizational strategy orientation”. The three items are averaged in order to form the composite measure of organizational strategy orientation. The mean value of the organizational strategy orientation variable is 3.29 with a standard deviation 0.96 (see Table 4.1), which indicate that we have substantial variation in our dependent variable. This variable should thus be seen in contrast to **locational strategy orientation**, which captures the strategy orientation towards more external factors like customers, suppliers, etc. The locational strategy orientation is measured by asking respondents to indicate on a 5-point Likert scale about the importance of different strategic drivers (1=not important at all and 5=very important). The three strategic drivers that form the organizational strategy orientation variable are: “Access to new markets for products and services”, “Increasing speed to market” and “Growth strategy”. The three items that are averaged in order to form the composite measure of locational strategy orientation have a Cronbach Alpha value of 0.65. This variable is included as a control variable to investigate the effect of firms’ general strategy orientation.

Offshoring experience is a measure of time (in years) since the focal offshoring implementation was launched. The assumption is that the longer the firm has been engaged in this particular offshoring project the more experience is accumulated related to this offshoring implementation. This approach is akin to other papers investigating the role of offshoring experience (e.g., Lewin *et al.*, 2009; Maskell *et al.*, 2007). While the firm may have offshoring experience from other offshoring activities, the gist of this measure is that it measure the experience specific to the particular offshoring implementation. However, we will control for other types of offshoring experience. The mean value of offshoring experience with the focal implementation is 8.88 years and it varies from 0 (two very recent implementations) to 44 years of offshoring experience (see Table 4.1).

Firms will gain more general offshoring experience through other offshoring projects than the focal one and this general offshoring experience might in a similar way speed up the accumulation of architectural knowledge. Therefore, we control for this more general offshoring experience by taking into account number of employees, functions and locations that the firm previously has offshored to. More specifically, we construct a variable measuring the **number of service functions** (e.g., IT, HR, legal, finance and accounting) that the firm has previously offshored and a variable measuring the **number of locations** that the firm has offshoring projects in. The third variable capturing the general offshoring experience is a measure of the **number of employees** that has previously been offshored.

In addition, we control for the nature of the offshored tasks as firms response to the organizational reconfiguration of offshoring may vary with the nature of the activities; e.g., one would expect that more standardized and self-manageable tasks provide less need for strategic response than less standardized activities (e.g., Sanchez and Mahoney, 1996). For this reason, we first control for the degree of **standardization of tasks** in each function. Another variable, taken from the ORN Provider Survey, include **commoditization of tasks** since offshoring projects in functions with high level of commoditization might be less prone to architectural challenges (see e.g., Manning *et al.*, 2011). Commoditization refers to a process by which services and processes become more standardized, and knowledge less specific to firm or product characteristics, lowering transaction and coordination costs for firms offshoring these processes (see Davenport (2005) for a similar definition). The use of **collaborative technologies** in the function is added to control for the use of information- and communication technology in the firm (Manning *et al.*, 2008). The above mentioned three control variables are measured as 5-point-Likert scale variables based on the perception of service providers. Assuming that international

interdependencies are more challenging to coordinate than co-located interdependencies (Srikanth and Puranam, 2011), we have added control variables for interaction distance that are based on secondary data on the distance between the home location and the foreign location of the offshore implementation. The interaction distance includes three dimensions: **geographical distance** measured as air miles between the home location and the offshore location, **cultural distance** between two locations based on the Kogut & Singh-index (Kogut and Singh, 1988), and **language distance** as a dummy variable indicating whether the same language is spoken both in the home location and in the offshore location. Finally, two dummies were added to control for whether the offshoring implementation was a business process offshoring (**BPO**) or a knowledge process offshoring (**KPO**). The third possible type, information technology outsourcing (ITO), was omitted and therefore serves as the baseline when interpreting the coefficients for BPO and KPO.

Results

The descriptive statistics (mean, standard deviation, minimum and maximum values) and correlation matrix for all variables are provided in Table 4.1. Since the data included some high correlation coefficients, in particular between functional and country experience and between the BPO- and KPO-dummies, we tested for the variance inflation factor (VIF) in all models as well as tested the models with and without the highly correlated variables. However, since the high correlations were only among our control variables the results for our key variables remained qualitatively the same irrespective of the specification of the model. The VIF values for all models were below six which is considered to be the threshold for detection of problems of multicollinearity (except for KPO which has a VIF value slightly above the threshold, however,

Table 4.1 – Correlation matrix including all variables (N=353)*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Offshoring experience	1													
2 Functional experience	0.29	1												
3 Country experience	0.37	0.76	1											
4 Employees offshored	0.08	-0.03	-0.06	1										
5 Standardization of task	0.04	-0.09	-0.09	-0.02	1									
6 Commoditization of task	-0.11	-0.15	-0.16	-0.01	0.26	1								
7 Collaborative technologies	-0.03	-0.05	-0.04	-0.03	0.33	0.02	1							
8 Locational strategy orientation	-0.05	0.13	0.01	0.13	0.05	0.08	-0.03	1						
9 BPO	0.11	0.15	0.22	-0.03	0.35	-0.32	0.09	-0.04	1					
10 KPO	-0.06	-0.03	-0.11	0.07	-0.52	-0.43	-0.42	-0.03	-0.55	1				
11 Organizational strategy orientation	0.13	0.21	0.15	-0.02	-0.2	-0.27	-0.02	0.35	-0.02	0.17	1			
12 Geographical distance	-0.01	-0.08	0.04	0.03	-0.02	0.07	0.08	-0.08	0.07	-0.14	0.06	1		
13 Cultural distance	-0.05	-0.04	-0.01	-0.03	0.03	0.04	-0.03	0.01	0.05	-0.06	-0.04	0.18	1	
14 Language distance	-0.11	-0.16	-0.1	0.1	-0.07	0.01	0.07	-0.05	-0.03	0.01	-0.02	0.43	-0.39	1
Mean	8.88	6.06	3.03	110	3.15	3.01	3.32	3.04	0.5	0.23	3.29	8521	8.89	0.44
Standard deviation	4.7	5.01	2.53	259	0.28	0.3	0.13	0.93	0.5	0.42	0.96	4186	5.49	0.49
Min. value	0	1	1	1	2.72	2.38	2.97	1	0	0	1	0	0	0
Max. value	44	21	10	2000	3.54	3.45	3.75	5	1	1	5	16244	31.5	1

* All coefficients above 0.10 are significant at 5% level

Table 4.2 – OLS-regression models (standard error in parentheses, VIF-values in italics)

	Organizational strategy orientation
Offshoring experience	0.02* (0.01) <i>1.25</i>
Function experience	0.02 (0.01) <i>2.64</i>
Country experience	-0.01 (0.03) <i>2.80</i>
Employees offshored	-0.01 (0.01) <i>1.07</i>
Standardization of task	-0.46* (0.20) <i>1.66</i>
Commoditization of task	-0.95** (0.32) <i>4.09</i>
Collaborative technologies	0.26 (0.47) <i>1.97</i>
Locational strategy orientation	0.40*** (0.05) <i>1.09</i>
BPO	-0.20 (0.20) <i>4.98</i>
KPO	-0.06 (0.26) <i>6.41</i>
Geographical distance	0.01* (0.01) <i>1.53</i>
Cultural distance	-0.01 (0.01) <i>1.83</i>
Language distance	-0.19 (0.14) <i>2.34</i>
Intercept	5.21* (2.24)
F-value	10.50
R-square	0.287
Adjusted R-square	0.260

***, ** and * indicate significance on 0.1, 1 and 5% level, respectively

this is expected as KPO, BPO and ITO is negatively correlated by design). See Table 4.2 where all VIF-value are included.

The results of the OLS regressions are presented in Table 4.2. The model includes our independent variable, offshoring experience, and all the control variables. Our independent variable comes out significant and positive ($\beta=0.02$ and $p<0.05$) indicating that offshoring experience related to the focal implementation is explaining the organizational strategy orientation. Stronger organizational strategy orientation is following with more experience on the focal offshore implementation. It is further notable that the other more general experience variables are all insignificant (functional experience, country experience and number of employees offshored) signifying that it is specific experience related to the focal offshoring implementation that matters rather than more general offshoring experience. As expected the more standardized and commoditized the offshored tasks the less scope for organizational strategy orientation, therefore both of these variables are significant negative. Locational strategy orientation, on the other hand, is significant positive reflecting that locational and organizational strategy orientation is not at the expense of each other, but rather that they reinforce each other. Among the distance variables it is only the geographical distance that turns significant.

In order to test for potential multilevel problems, a random coefficient model was conducted with Region (i.e., the region that hosts the implementation) as the group variable. However, only 5% of the variation in our dependent variable could be related to the region (i.e., an intra-class correlation of 0.05 in the empty models) and the random effects of the intercept at the between-level was insignificant ($p = 0.04$). This indicates that a random coefficient model is inferior to the applied OLS-models.

4.6 DISCUSSION

This paper investigates how the organizational reconfiguration of offshoring impacts firms' strategies. Offshoring describes the disintegration and relocation abroad of business services that

support domestic or global operations (Contractor *et al.*, 2010; Manning *et al.*, 2008). A major challenge in this respect is thus reintegration of the offshored activities into the organizational architecture (Mudambi and Venzin, 2010). In respect to offshoring, the organizational architecture can be defined as decision makers' more or less intentional choices to ensure that geographically dispersed organizational components and activities co-exist and are linked to one another in an effective way (cf., Ethiraj and Levinthal, 2004a; Nadler and Tushman, 1997; Sah and Stiglitz, 1986).

Using a mixed methods approach, we have first presented the case of Nokia Denmark and its decision to offshore certain product development activities to Taiwanese Foxconn in a joint R&D model. The case shows how the decision to offshore was initially driven by external objectives such as lower costs and access to strategic resources, but that this changed over time towards internal objectives. Based on this analysis, we induced a testable research hypothesis that argues that firms with offshoring experience are more likely to acknowledge and consider the organizational architecture in their strategies than firms with little experience. The assumption is therefore that firms with experience are more likely to have been exposed to architectural challenges, and are as a result more likely to have accumulated architectural knowledge. We found empirical support for this hypothesis using a dataset with 353 offshoring implementations reported by 129 U.S. and European firms. This suggests that the more experience the firm has with a specific offshoring project, the more likely it is to encapsulate the organizational architecture in its strategies. Interestingly, while we found experience measured in years since the implementation to be significant in explaining organizational strategy orientation, other experience measures such the number of countries and activities on a firm level turned out insignificant. This may suggest that architectural knowledge within the single implementation is

residual and sticky (von Hippel, 1994) and, as such, is difficult to transfer across implementations and organizations.

This paper contributes to research on the organizational design and architecture of offshoring as well as on the dynamics of organizational architectures. First of all, previous research on offshoring has been biased towards understanding either the antecedents or the outcomes of offshoring implementations (Lewin *et al.*, 2009; Doh *et al.*, 2009; Kedia and Mukherjee, 2009; Mol *et al.*, 2005), and has ignored how firms actually approach offshoring. In contrast, this paper seeks to investigate the organizational architecture of offshoring implementations and how this impacts offshoring strategies. By showing that firms only seem to acknowledge the organizational architecture of offshoring with experience, we add a perspective on firm behavior that is in support of research that finds that most offshoring decisions are taken opportunistically, without corporate-wide strategies that delineate specific plans and guidelines for the adoption and implementation of offshoring activities (Lewin and Peeters, 2006; Massini *et al.*, 2010). However, rather than assuming that the successful architecture of firms' offshoring activities can a priori be planned and implemented, we suggest that this is more a subject of continuous learning and improvement through accumulation of architectural knowledge within the given implementation. An interesting topic for future research thus relates to understanding firms' specific offshoring knowledge strategies and how this impacts performance. Moreover, while this research has focused on strategic orientation to illuminate this strategic response, future research could investigate how firms actually interact with the organizational design—i.e., which changes they implement—as they gain offshoring experience and architectural knowledge.

More broadly, this research has implications for literature that seeks to understand how different architectural forms and practices correlate to organizational performance (e.g., Datta, 1991; Foss *et al.*, 2011; Zott and Amit, 2008; Sah and Stiglitz, 1986). In particular, our argument is that firms adopt their strategies to accommodate for architectural inefficiencies. As such, we pose that strategy follows structure (Hall and Sajas, 1980), but that this causality is contingent upon the accumulation of architectural knowledge. Thus, while certain organizational architectures may prove superior to others, this research suggest that superior organizational performance is more a result of a process where decision makers accumulate architectural knowledge than it is a result of a conscious strategy. Decision makers need to identify and uncover underlying interdependency structures in the organizational architecture by systematizing and accumulating knowledge and learning processes within the firm. This is in line with research that notes that architectural effectiveness is an outcome of the organization's ability to balance the search for organizational decisions and the exploitation of these once found (Rivkin and Siggelkow, 2003; Siggelkow, 2002). However, we extend this research by suggesting that it is the bounded rational decision maker who incrementally gains and accumulates knowledge on how to design the organizational architecture with the purpose of optimizing performance.

Limitations

This study does not go without limitations. For example, we argue that firms' organizationally oriented strategies can be explained by firms' experience. As firms face organizational challenges deriving from an international architecture, they will begin to search and accumulate architectural knowledge that can be deployed in offshoring strategies. However, our quantitative

research design does not allow us to consider the actual challenges that firms face following the implementation (although the qualitative part provides some indications). Similarly, we have not empirically been able to say anything about different types of experience within the single implementation. For example, Madsen and Desai (2010) find that experience with failure leads to higher organizational performance than experience with success. Thus, future research could investigate what type of experience contributes more to the successful organizational adaptation following the offshoring implementation.

Concluding remarks

A key issue in this paper is how organizational architectures evolve to become more effective. By studying how offshoring experience prompts firms to formulate more organizationally oriented strategies, we have emphasized the role of knowledge accumulation following an organizational reconfiguration (i.e., the offshoring implementation). This conceptualization builds on previous research on architectural evolution that observes that the successful organizational architecture is the result of a process in which the organization is able to search for new and good organizational decisions and to exploit these decisions once found (Rivkin and Siggelkow, 2003; Siggelkow, 2002). Yet, we go beyond this by aligning the theoretical development with the bounded rational decision maker who incrementally gains and accumulates knowledge on how to most appropriately design the organizational architecture with the purpose of optimizing performance. The Nokia management's decision to relocate product development activities to China disrupted the effectiveness of the organizational architecture, which consequently prompted them to search for alternative architectural arrangements so that the fit could be restored. Thus, we propose an evolutionary view on the organizational architecture that

can be depicted as an iterative process between decision makers' search for architectural opportunities and the accumulation of architectural knowledge which increases the likelihood of taking decisions that will lead to more effective organizational architectures. Accordingly, strategy follows structure (Hall and Sajas, 1980), but only to the extent that the decision maker successfully accumulates architectural knowledge.

Chapter 5

Organizational adaptation in offshoring: The difference between an experimental and experiential learning strategy¹

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Abstract: This paper builds a model that examines the performance implications of how firms adapt when offshoring. We emphasize that firms must accumulate architectural knowledge for efficient adaptation and that this can be done through either an experimental learning strategy (home-based learning before the offshoring implementation) or an experiential learning strategy (learning-by-doing after the offshoring implementation). Our analysis suggests that the relative attractiveness of the experiential strategy decreases with distance and coordination costs but increases with uncertainty. Moreover, uncertainty has a positive moderating effect on the relationship between distance and the experiential strategy. Accordingly, by formalizing two different architectural knowledge strategies in the context of offshoring we show how important contingencies can lead to significant performance tradeoffs in the identification of optimal organizational configurations.

Keywords: adaptation, architectural knowledge, coordination costs, offshoring, organizational configuration.

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5.1 INTRODUCTION

The purpose of this paper is to build a model that examines the performance implications of how firms adapt when offshoring; i.e., relocating organizational activities to foreign locations (Contractor *et al.*, 2010; Lewin and Peeters, 2006; Manning *et al.*, 2008). There is much literature on organizational change that investigates how firms adapt through the patching, recombination and reconfiguration of firm activities (Eisenhardt and Brown, 1999; Karim and Mitchell, 2004), resources (Galunic and Rodan, 1998), and divisional boundaries (Hoskisson and Johnson, 1992; Birkinshaw and Lingblad, 2005). Faced with suboptimal configurations, firms therefore reconfigure their organizations with the purpose of increasing efficiency (Chandler, 1962; Helfat and Eisenhardt, 2004; Henderson and Clark, 1990; Karim, 2009).

However, when a firm decides to relocate organizational activities to foreign locations, it needs to accommodate for how the added distance (e.g., geographic, cultural and institutional) between different organizational activities impacts performance (Kumar *et al.*, 2009; Larsen *et al.*, 2012; Srikanth and Puranam, 2012). For example, firms that fail to anticipate and align the complexity of dispersing organizational activities into the offshoring strategy encounter significant gaps between expected and achieved performance (Larsen *et al.*, 2012). As such, the international component of offshoring characterizes a contingency that complicates the more conventional understanding on the organizational change and reconfiguration.

In an attempt to bridge the abovementioned literatures, we build a model that allows us to systematically analyze the performance implications of firm adaptation in the context of offshoring. Central to our model is the accumulation of architectural knowledge; i.e., knowledge on firms' underlying technological landscape describing how the components of their organizational systems are related to each other (Baldwin and Clark, 2000; Brusoni and

Prencipe, 2006; Ethiraj and Levinthal 2004a; Henderson and Clark, 1990; Puranam *et al.*, 2012). Based on this knowledge, firms can reconfigure the organizations in a way that matches their underlying technological landscape. In this respect, we argue that firms can choose between two opposing strategies. On the one hand, firms can pursue an *experimental learning strategy* in which they seek to accumulate architectural knowledge prior to the actual offshoring relocation takes place. Here, firms can accumulate architectural knowledge by experimenting with different configurations while the activities are still co-located at home. On the other hand, firms can pursue an *experiential learning strategy* in which they accumulate architectural knowledge after the reconfiguration has taken place (i.e., learning-by-doing).

Our model allows us to suggest that firms face a trade-off when choosing how to approach offshoring. We find that the attractiveness of the experimental learning strategy increases with distance and coordination costs. As the cost of coordinating an international organization are higher than the gains of production abroad, firms benefit from accumulating architectural knowledge prior to the international reconfiguration. However, when the uncertainty of firms' underlying technological landscape increases, they are better off by choosing an experiential learning strategy. Uncertainty creates noise which makes it increasingly difficult for firms to estimate the impact and consequences of the organizational reconfiguration. Moreover, we find that uncertainty has a positive moderating effect on the relationship between distance and the attractiveness of the experiential learning strategy, as it lowers the effect of learning at home and leaves the firm more vulnerable to higher coordination costs once it goes abroad. As such, uncertainty signifies a lower signal-to-noise ratio which leads to situations of causal ambiguity (Lippman and Rumelt, 1982), and the value of accumulating architectural knowledge through the experimental learning strategy is undermined.

A main contribution of this paper lays in the portrayal of firm adaptation in the context of offshoring. Specifically, by modeling the process of adaptation in the context of offshoring, we emphasize the importance of accumulating architectural knowledge when relocating organizational activities abroad as well as how the impact of distance may undermine deliberate efforts to reconfigure firms' organizations. Moreover, by proposing a performance trade-off between the experimental and experiential learning strategy, we counter conventional wisdom on the value of preparation in offshoring (e.g., Heijmen *et al.*, 2008; Lewin and Couto, 2007; Massini *et al.*, 2010). We do this by showing how the two approaches to offshoring can have different consequences, and that a home-based, experimental learning strategy is not always beneficial. In addition, we argue that adaptation within a given configuration is not always a result of cumulative learning-by-doing over long periods of time (Nelson and Winter, 1982; Adler and Clark, 1991), but can rather be planned ahead. As such, we provide impetus to a paradox that firms face when deciding to reconfigure internationally by stressing that the optimal strategy is subject to learning and depends on the signal-to-noise ratio.

Our paper proceeds as follows: In the next section, we introduce the theoretical background of the paper by elaborating on offshoring and the role of architectural knowledge in organizational adaptation. Next, we introduce the model employed to investigate the performance implications of the experimental and the experiential learning strategies. We then present and discuss the findings the model, before we finally discuss the implications of the paper.

5.2 OFFSHORING, ORGANIZATIONAL RECONFIGURATION, AND ARCHITECTURAL KNOWLEDGE

The decision to offshore organizational activities can be driven by a number of different factors, including market proximity, access to cheap labor, knowledge and other strategic resources (Doh *et al.*, 2009; Lewin *et al.* 2009; Kedia and Mukherjee 2009). For example, Lewin *et al.* (2009: 901) find that firms are increasingly offshoring innovation activities in an “*emerging global race for talent*” in which domestic shortages of qualified engineers force firms to relocate R&D activities to foreign locations. Evidently, the pursuit of offshoring strategies has been a prolific adventure for numerous firms in which expectations have been met or even surpassed by the actual offshoring performance (e.g., Dossani and Kenney, 2003). At the same time, many companies are experiencing that the practice of offshoring entails additional challenges and greater costs than were originally anticipated (e.g., Aron and Singh 2005). For example, a firm may realize that the relocation of activities abroad undermines previously coherent flows of knowledge between different business units, and that spending additional resources on communication technologies are required to uphold necessary knowledge flows. Recent research on the hidden costs of offshoring suggests that unanticipated costs of implementing offshoring activities abroad may eventually undermine performance (Dibbern *et al.* 2008, Larsen *et al.*, 2012; Stringfellow *et al.* 2008).

In order to further our understanding of the performance implications of offshoring, we contend that firms must reconfigure their organizations to accommodate for the shift from originally co-located activities to an organization with geographically dispersed activities. In this respect, the literature on organizational change and reconfiguration is helpful (e.g., Brusoni and Prencipe, 2006; Eisenhardt and Brown, 1999; Ethiraj and Levinthal, 2004a; Karim, 2006; 2009;

Zhou, 2011). Organizational reconfiguration can be defined as the changes and rearrangements to firms' structural organization—i.e., the resource allocations within firms, use of internal routines and communication network, and the flow of information and tasks—with the purpose of increasing effectiveness and efficiency (Chandler, 1962; Levitt and March, 1988; Galunic and Eisenhardt, 1996; Helfat and Eisenhardt, 2004; Karim 2009). This includes the recombination and redeployment of activities, resources, and divisional boundaries (Birkinshaw and Lingblad, 2005; Henderson and Clark, 1990; Karim and Mitchell, 2004).

A central component of firms' reconfiguration efforts is the adaptation to underlying technological landscapes describing the micro-level activities that constitute their business and the structure of knowledge links between those activities (Ethiraj and Levinthal 2004a; Rivkin and Siggelkow, 2003). For example, a firm may consist of a number of interdependent activities, such as designing components, producing and assembling products and marketing efforts, that is crucial for the firm's existence and survival (Van de Ven *et al.*, 1976). The structure and interdependencies of these underlying activities constitute a firm's technological landscape, and as such represents the firm's "*true underlying structure of the system of interdependent choices*" (Ethiraj and Levinthal, 2004b: 162). The purpose of reconfiguring elements in firms' structural organization (e.g., the resource allocations, use of internal routines and communication network, and the flow of information and tasks) is therefore to match the underlying technological landscape. The firm may over time make configurational changes such as recombining and redeploying activities, resources and divisional boundaries as a means of adapting to the underlying technological landscape. The closer the match between the organizational configuration and the technological landscape, the better is the firms' optimal utilization of its resources and thus performance (Levinthal, 1997).

However, for firms to successfully adapt to a technological landscape, a high level of architectural knowledge is necessary (Baldwin and Clark, 2000; Brusoni and Prencipe, 2006; Ethiraj and Levinthal 2004a; Henderson and Clark, 1990; von Hippel, 1990). Architectural knowledge can be defined as an “*understanding of how components in an organizational system are related to each other*” (Puranam *et al.*, 2012: 420), and comprises knowledge about individual organizational activities and how these are integrated into an orchestrated organizational system. For example, Henderson and Clark (1990) refer to architectural knowledge as consisting of knowledge about the different components underlying a distinct system (i.e., product technology) and knowledge about how the components are integrated into an orchestrated systemic whole. When firms alter their organizational configurations, they need knowledge on how the underlying technological landscape with its sub-activities and interdependencies function so that successful adaptation to the new environment can be exercised. For example, firms need knowledge on whether and how change in one activity affects the performance of another activity so that they can efficiently allocate resources among the two activities. Thus, the firm needs architectural knowledge to identify how to best adapt to an unknown but inherent technological landscape (Ethiraj and Levinthal 2004a).

At the same time, a technological landscape is inevitably characterized by various degrees of uncertainty that complicates adaptation (Anderson and Tushman, 1990; Fleming, 2001). In general, uncertainty refers to the inability to predict and foresee (Anderson and Tushman, 1990). Factors such as demand fluctuations (Storper, 1996) and technological change (Teece and Pisano, 1994) create an uncertain technological landscape that undermines firms’ adaptation efforts. For example, in product and organizational life cycles, uncertainty is generally assumed to be higher in early stages and decreases once a dominant design has been

found (Klepper, 1997). Thus, the higher the uncertainty is, the more difficult is it for the firm to accumulate appropriate architectural knowledge so that successful adaptation can be exercised.

Based on this, the research question we pose in this paper is: What are the performance implications of how firms adapt when offshoring? As offshoring signifies that originally co-located activities are relocated to foreign locations, a substantial reconfiguration is initiated with consequences for issues such as the interdependencies and coordination mechanisms between the spatially differentiated organizational tasks and activities (Kumar *et al.*, 2009) and the overall coherence of the globally dispersed organizational system (Srikanth and Puranam, 2011). In this process, firms need to adapt to the technological landscape by accumulating architectural knowledge through incremental changes within the new configuration (e.g., small alterations to the division of labor to reduce coordination costs) so that organizational performance can be optimized. In this respect, firms' level of architectural knowledge is crucial as it enables the firms to identify how the underlying structures in which the individual activities are integrated and linked together in a coherent organizational system.

However, when firms offshore activities, distance is added to the interdependencies between organizational activities (e.g., geographic, cultural and institutional). A firm that relocates disaggregated organizational tasks and sub-components abroad must coordinate an international chain of activities across geographies, cultures and different institutional systems (Kumar *et al.*, 2009; Niederman *et al.* 2006; Srikanth and Puranam, 2011). This may prove challenging on a number of dimensions. For example, not only may offshoring provoke internal resistance (e.g., Lewin and Couto, 2007), but it may also hamper operational efficiency due to lack of trust, status differences between domestic and foreign units, and lack of understanding and communication in the process of delivering tasks, and interacting with offshore units (e.g.,

Vlaar *et al.*, 2008; Levina and Vaast, 2008). Employees with cultural and language differences at geographically dispersed locations are refrained from informal face-to-face coordination, and are forced to rely on less superior technology-based coordination mechanisms (Storper and Venables, 2004). Thus, with distance coordination costs are likely to increase (Srikanth and Puranam, 2011).

5.3 THE MODEL

We build a model that allows us to investigate how a firm adapts in the contexts of offshoring where a firm changes from consisting of solely co-located activities to a having configuration with geographically dispersed activities. In the model, the firm faces a fixed, exogenous technological ‘landscape’ describing the micro-level activities that constitute its business and the structure of knowledge links between those activities. Given this landscape, the firm may over time make incremental changes to the configuration as a means of adaptation by assigning and reassigning different activities to different organizational units (e.g., departments, plants, research centers, groups, or other organizational units) so that it matches the technological landscape.

Two learning strategies

In the model, we assume that the company initially has no architectural knowledge and that it needs architectural knowledge to successfully adapt to the technological landscape. In this respect, we argue that the firm can choose between two different strategies. On the one hand, a firm can accumulate architectural knowledge prior to the actual offshoring implementation by employing different measures to understand how to best adapt to the underlying landscape. This

would entail a comprehensive task of understanding, mapping, and documenting the role and function of the activities to be offshored and how these are interconnected while these are still co-located. This strategy is in accordance with the literature suggesting that firms with corporate-wide strategies articulating how the offshoring process should be exercised are generally better off in terms of performance (e.g., Heijmen *et al.*, 2008; Lewin and Couto, 2007; Massini *et al.*, 2010).

To illustrate this strategy: when the Danish-based Maersk Line, the world's largest shipping company, decided to offshore its purchasing logistics department from Denmark to the Philippines, it embarked on a process of formalizing, standardizing and specifying the interdependencies surrounding the activity to be offshored while these were still domestically located. Mærsk did this by hiring a project manager with the responsibility of 'tapping' the knowledge of the operational purchasers and to write scripts about how to handle the purchasing request. This way, Mærsk was better able to understand the technological landscape underlying the activity to be offshored. Once the activity was relocated to the Philippines, ambiguity regarding how the processes were managed was reduced, and as a result, the risk of unexpected challenges to emerge was undermined. We term this an *experimental learning strategy* as the firm would experiment with different adaptations efforts while the activities are still co-located.

On the other hand, a firm can choose to approach offshoring as a learning-by-doing process. In this respect, the firm commences the search for optimal organizational configurations based on the technological landscape during the offshore delivery phase as they encounter the actual coordination costs of offshoring. The firm would thus avoid up-front investments in accumulating architectural knowledge during the onsite transition phase, but would rather accumulate architectural knowledge through experiential learning with offshoring. As firms

encounter the challenges of offshoring, they are then better able to understand how to adapt to this with the purpose of increasing performance. This approach is therefore supportive of research that views offshoring as a learning-by-doing process (e.g., Jensen, 2009; Manning *et al.*, 2008; Maskell *et al.*, 2007), and more generally of literature that holds that adaptation should be seen as a result of cumulative learning-by-doing over long periods of time (Nelson and Winter, 1982; Adler and Clark, 1991).

For example, in the early 2000s, LEGO Group decided as part of a comprehensive restructuring process to rather rapidly offshore up to 80 percent of its production to a number of different international sites. In this process, LEGO did not significantly experiment with different configurations prior to offshoring, and consequently faced major unexpected coordination challenges after the activities were relocated. For example, after offshoring LEGO experienced that the effective knowledge transfer and coordination were much more challenging than originally expected. As a result, LEGO began to search for alternative coordination mechanisms, and eventually pursued a rigorous strategy of codification and standardization of the organizational interdependencies and processes. Based on this international experience, LEGO increasingly learned how to reconfigure its processes to ensure operating efficiency. We therefore term this an *experiential learning strategy*.

Accordingly, in our model the firm can adapt to the technological landscape by accumulating architectural knowledge either prior to the offshoring implementation (the experimental learning strategy) or after the offshoring implementation (the experiential learning strategy).

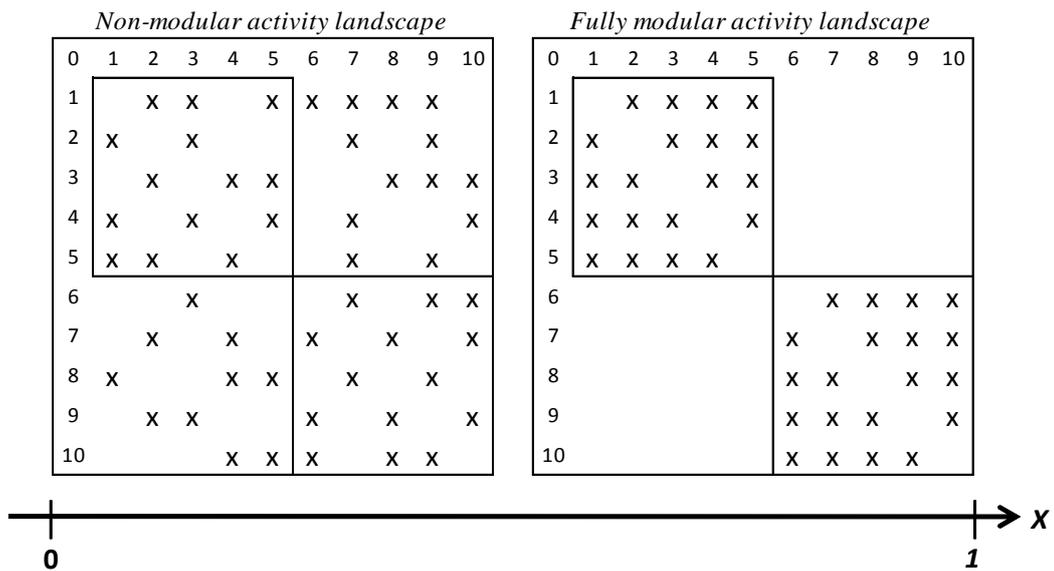
Modeling the technological landscape

Consider a firm that performs a number of different activities that are to various extents interdependent on one another. The technological landscape describes whether the activities are interdependent, in which case they need to be coordinated (by, for example, meetings between the workers responsible for the different activities or other types of knowledge transfer). Without loss of generality we assume 100 activities, in which case the maximum number of interdependencies is 4,950 (i.e., $(100*99)/2$).

The structure of the interdependencies in technological landscape is of course not completely random. Often, activities can be grouped according to their natural interdependencies. For example, some activities might be described as ‘research’, and these activities may generally be more tightly coupled with each other than they are with activities described as ‘production’ (and vice versa). To capture this idea we assume that the landscape consists of two larger ‘natural modules’, in which activity 1-50 belongs to Module A and activity 51-100 belongs to Module B. Modularity theory suggest that a landscape is modular if the interdependencies of the activities between the modules is low and the interdependencies of the activities within the modules is high (Baldwin and Clark, 2000; Sanchez and Mahoney, 1996). In contrast to an integral landscape in which the performance of different activities is highly dependent on each other, a modular landscape is characterized by standardized and minimized interdependence between different modules so that these can operate as controlled ‘black-boxes’ in a larger organizational system (Schilling 2000; Ulrich 1995). Based on this, we define the technological landscape’s *degree of modularity* (x) as the extent to which the interdependencies between activities occur within, rather than across, Modules A and B.

As an example of these concepts, consider Figure 5.1 in which the interdependencies between 10 different activities are marked by “X”. With low modularity ($x = 0$), activities are interdependent on other activities both within the same and the other module. Hence, there is no obvious way for the firm to group its activities into two modules, and regardless of the way it chooses to do this there will remain a significant need for coordination across units. With full modularity ($x = 1$), on the other hand, each activity is only interdependent on other activities within the same module. Presumably, this will make it much easier for the firm (once it has accumulated the architectural knowledge to do this) to group its activities into two neatly defined modules which then become more or less self-contained with a minimal need for coordination with other modules.

Figure 5.1 – The technological landscape



Such a grouping, in turn, may mitigate the coordination costs of offshoring in a number of ways. For example, a major source of coordination costs in offshoring relates to facilitating and communicating transfer of information and knowledge between the globally dispersed and disaggregated business modules (Dibbern *et al.* 2008, Kumar *et al.* 2009). A high degree of tacit, non-standardized knowledge causes misalignment and misunderstandings between the dispersed units, which in turn are intensified by the distance and intensity of the interactions between the units (Stringfellow *et al.* 2008). However, as modularity would signify a minimization, codification, and standardization of the linkages between different separately located activities, it would thus reduce the need for coordination.

Realistically, most configurations will of course neither be completely integral ($x=0$) nor completely modular ($x=1$), but something in between those two extremes. The extent to which a pair of activities are interdependent on each other is decided by a binominal choice (0, 1) and is determined by the probability $p_{ij} = xM_{ij} + \frac{1}{2}(1-x)$, where $M_{ij} = 1$ if activities i and j are in the same natural module (in other words, both in A *or* both in B) and 0 otherwise. The higher x , the more modular is the landscape. To see that, setting $x=0$ results in $p_{ij} = \frac{1}{2}$ —implying that the natural modules have no impact on the random structure of interdependencies (and hence are not really natural at all)—while setting $x=1$ results in $p_{ij} = M_{ij}$ which makes the interdependencies fall predictably into the two natural modules. The derived technological landscape with its predefined interaction structure remains constant throughout the individual runs of the model.⁴

⁴ Our modeling of the technological landscape is similar to ones proposed by Ethiraj and Levinthal (2004a; 2004b) as we model a configuration that has an unknown but inherent interaction structure to which the firm needs architectural knowledge to identify how to best adapt to the configuration. In contrast to NK-performance landscapes with rugged or purely random interaction structures (e.g., Kauffman, 1993; Levinthal, 1997), this type of

Modeling performance

Given the organization's configuration, managers make adaptation choices regarding the structure of the activities; i.e., each activity's assignment to a module and thus also its location (at home or abroad). Unlike the technological landscape which is fixed, the adaptation efforts are endogenous to the decisions of managers. At any given time, there is no guarantee that the adaptation of activities in the firm's modules reflects the grouping implied by the natural modules (although, *ceteris paribus*, the coordination costs of the firm would be lower if it did). The purpose of accumulating architectural knowledge is therefore to understand the technological landscape so that efficient adaptation can be exercised.

We assume that the company will adapt with the purpose of increasing performance. We model performance as the result of a constant revenue (denoted I) from which we subtract the costs of production at home (C_H) and abroad (C_F), and the costs of coordination (K). We assume that the activities can be conducted at a lower cost level abroad ($C_H > C_F$). Finally, we add a stochastic term (ε) whose variance (σ) captures the degree of uncertainty (see Nelson and Winter, 1982; Klepper, 1996, for similar approaches to modeling uncertainty). Performance is thus given by

$$\pi = I - A_H C_H - A_F C_F - K + \varepsilon \quad [1]$$

where A_H is the number of activities at home location and A_F is the number of activities at the foreign location. In the model, we set $I = 1,000$, $C_H = 1$, and $C_F = 0.6$.

modeling uses modularity to create locally correlated landscapes (Bar-Yam, 1997), which is particularly beneficial as we model the process of relocating organizational activities that to various extents are modular to foreign locations (Contractor *et al.*, 2010).

We assume a ‘marginal coordination cost’ k is incurred for every activity pair that is linked by interdependencies (e.g., marked with an X in Figure 5.1). We assume that the cost of coordinating two activities within the same module is lower than the cost of coordination activities between the two modules (e.g., Sanchez and Mahoney, 1996), even if these two modules are located in the same country. As activities within each module may share common input, develop their own tacit knowledge, informal communication styles and formal communication channels, and value systems, the cost of coordination within a module becomes lower than the cost of coordination between modules (Schilling 2000; Ulrich 1995; Zhou, 2011). Thus, intra-module activities can to a larger extent base their coordination on common ground and knowledge whereas inter-module activities rely more on costly ongoing communication (Srikanth and Puranam, 2011). Formally, this can be expressed as $k_{LW} < k_{LB}$, where the subscript L refers to local coordination and W and B refers to within and between modules, respectively. For simplicity and without loss of generality, we set $k_{LW} = 0$ in the model.

Moreover, geographic distance compounds the costs of coordinating across modules. For example, the lack of face-to-face contact makes it more difficult to exchange tacit knowledge over distance. We capture this by assuming that $k_{LB} < k_{IB}$, where I subscripts marginal coordination costs of international activities, so that there is a hierarchy of coordination costs $k_{LW} < k_{LB} < k_{IB}$. We set $k_{IB} = (1+D)k_{LB}$ and let $D \geq 0$ capture the impact of geographic separation on coordination costs, where $D = 0$ means that geographically dispersed coordination is no more difficult or costly than co-located dispersion (no impact of separation) and $D \rightarrow \infty$ that geographically dispersed coordination is completely impossible (prohibitive impact). Hence, D can be interpreted as the *distance* between the home base and the offshoring

location, broadly defined as geographic, cultural, psychic, institutional or other dimensions of distance to the extent that these have an impact on coordination costs.

With these assumptions, the total cost of coordination is determined by the number of local inter-module (N_{LB}), and international inter-module (N_{IB}) interdependencies, as follows:

$$K = N_{LW}k_{LW} + N_{LB}k_{LB} + N_{IB}k_{IB} = (N_{LB} + N_{IB}(1+D))k_{LB} \quad [2]$$

In this formula, the number of activity pairs with interdependencies (N) is multiplied with the marginal costs of coordination (k) for each type of interdependency.

Modeling adaptation

In each period, managers take one activity at random and experiment with reassigning it to the other module, observe changes in performance, and cancel the reallocation if it leads to lower performance. For each reassignment, firms incur switching costs (e.g., Farrell and Shapiro, 1988). However, since this is a constant cost for all reassignments efforts, we choose not to include this in our model. A moved activity will thus retain its new location if the sum of the marginal change leads to a cost reduction. If the opposite is the case, the activity will be relocated back to its original location. The decision maker is therefore suffering from bounded rationality to the extent that he or she does not know ex ante what the optimal configuration is before the actual performance implications are experienced. Hence, an activity is ultimately moved only if it leads to a decline in costs:

$$\Delta(A_H C_H + A_F C_F) + \Delta K < 0 \quad [3]$$

In sum, the model portrays the process of adapting to a technological landscape by accumulating architectural knowledge by allocating activities between domestic and foreign locations with the purpose of increasing performance. In other words, our model is a model of

adaptation (cf., Ethiraj and Levinthal, 2004a; Rivkin and Siggelkow, 2003) towards the optimal locational distribution of organizational activities in an international setting.

5.4 ANALYSIS

In the following, we use our model to examine the performance implications of how firms adapt when reconfiguring internationally. In conjunction with the architectural knowledge accumulation strategies portrayed above, we construct and compare two scenarios: one in which the firm searches for an optimal configuration prior to the offshoring implementation while the activities are still at home (*the experimental strategy*), and one in which the firm searches for an optimal configuration after the actual offshoring implementation (*the experiential strategy*). In the experimental strategy the firm initially divides its activities into two modules at random (reflecting its initial lack of architectural knowledge) and then over time experiments with reallocations of activities between these two modules while it observes the effects on performance (and thus accumulates architectural knowledge). After a period of learning has passed, it moves one of the two modules to the foreign location where the adaptation process continues. In contrast, in the experiential approach the firm also divides its activities into two modules, but not until the actual time of offshoring. Only then does it react to the increased coordination costs by reallocating activities (i.e., learning-by-doing).

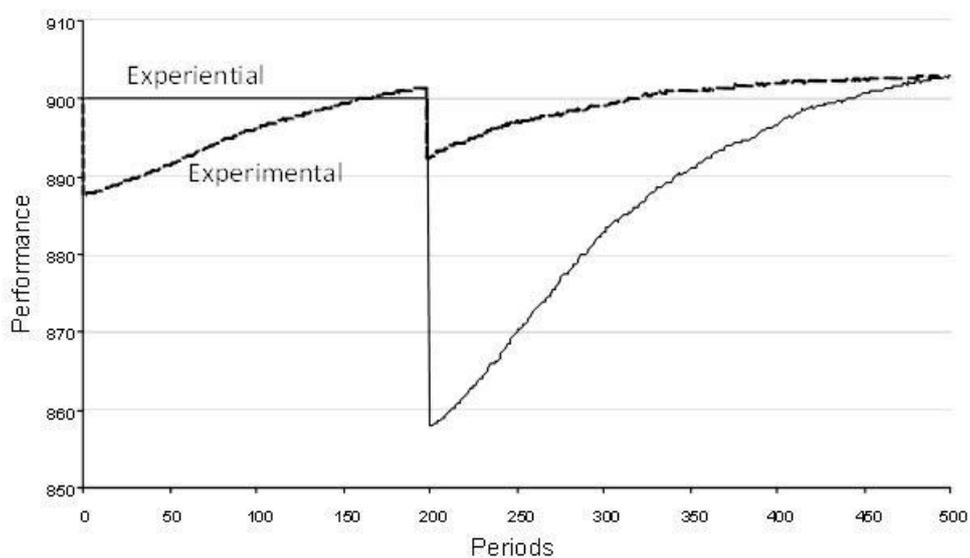
We estimate current and accumulated performance over 500 periods, in which the firm begins to offshore activities abroad after 200 periods. This means that the firm can use period $t \in [0,199]$ to identify the optimal configuration for offshoring in the first scenario (using the experimental strategy), whereas in the second scenario (using the experiential strategy) the firm does nothing prior to offshoring but only pursues a learning-by-doing approach after offshoring

($t \in [200, 500]$). The following analysis is two-pronged: First, we describe and compare the performance profiles of the two knowledge accumulation strategies with the purpose of understanding how performance evolves and deviates over time. Second, we subject the model to a Monte Carlo simulation and apply empirical estimation techniques to derive testable research propositions regarding the relative attractiveness between the experimental and experiential strategies.

Understanding the process of adaptation

The performance profiles of the two knowledge accumulation strategies are shown in Figure 5.2. With the experimental strategy, the firm experiments with the activities' configuration prior to the actual offshoring (i.e., when all activities are still kept domestically) to gain architectural knowledge and understand how different configurations performance. As the figure depicts, a

Figure 5.2 – Performance profile of the two strategies



firm that pursues an experimental strategy sees that the costs of accumulating architectural knowledge reduce immediate performance prior to offshoring. However, this effect is only temporary. As the firm incrementally learns and accumulates knowledge of how to configure in a most profitable manner prior to offshoring in a domestic context, it experiences increasing performance. The firm's performance increases over time as it discovers new configurations for its activities that yield higher performance. Moreover, since the firm has utilized the period prior to offshoring to identify a configuration that reduces the coordination costs, the added coordination costs when actually relocating activities abroad ($t = 200$) will only be marginal. The firm can therefore relocate the activities abroad without major disruptive performance implications. Thus, the firm accumulates architectural knowledge while the activities are still co-located which subsequently reduces the increased coordination costs of offshoring.

With the experiential strategy, in contrast, the firm does not experiment with different organizational configurations prior to offshoring. Rather, the firm embarks on a learning-by-doing approach to identify the optimal configuration for its activities after the offshoring implementation, and only experiments with different configurations once the activities have been relocated and the extra coordination costs encountered. This approach is akin to a scenario where a firm chooses to offshore activities more opportunistically, without having invested in significant preparation measures prior to offshoring. A consequence of this is that the firm does not accumulate any architectural knowledge prior to the actual offshoring. Because of this, the performance is held constant up to the point of implementation, as demonstrated in Figure 5.2. However, at the point where the firm commences offshoring ($t = 200$), it will due to the added distance between the domestic and foreign activities experience that the cost of coordination is significantly higher than prior to the implementation. It is therefore at this point that the firm will

begin the process of experimenting with different configurations with the purpose of increasing performance. Thus, the firm does not utilize the period when the activities are still co-located to identify a configuration that can reduce the increased coordination costs of offshoring, but rather investigates different configurations based on its international experience.

As evident in the figure, the differences in performance between the two approaches present firms with a dilemma. In case the added coordination costs of offshoring (the right-most area between the two curves) are higher than the costs of accumulating architectural knowledge prior to offshoring (the left-most area between the two curves), the experimental approach to offshoring displays higher accumulated performance than the other strategy. Conversely, in case the costs of accumulating architectural knowledge prior to offshoring are higher than the added costs of coordination of offshoring, the experiential strategy displays higher accumulated performance.⁵

The inclusion of uncertainty to the model makes the picture more complicated, however. As illustrated in Figure 5.3, a firm pursuing an experimental strategy to offshoring would in the absence of uncertainty incrementally learn and accumulate knowledge of how to configure the organization to increase performance. By contrast, if there is high uncertainty in the technological landscape, it is evident that this learning is less likely to occur and the firm's performance does not increase prior to offshoring despite an experimental search for new configurations that yield higher performance. Thus, uncertainty creates noise in the performance

⁵ Of course, our use of accumulated performance as an objective is a simplification which deserves some elaboration. Arguably, it would be more realistic to assume that the firm's objective was to maximize the net present value of the profits resulting from the strategies, in which case early performance is weighed more heavily than late performance. However, because the temporal ordering of the two strategies are always similar (the experiential strategy has higher performance than the experimental strategy before offshoring and lower performance after) such an assumption would not change our results, but merely shift the point of equivalence towards the experiential strategy. Hence, myopic firms with high discount rates would be more attracted towards the experiential strategy, whereas future-oriented firms with low discount rates would be more attracted towards the experimental strategy, everything else being equal. These predictions are so obvious, however, that we do not elaborate further on them.

which overwhelms the relative low coordination costs at home, leading to situations of causal ambiguity (Lippman and Rumelt, 1982). As a result, the decision maker cannot evaluate the effects of its organizational decisions before offshoring. Decision makers may thus find that organizational configurations and preparation measures taken *prior* to offshoring in an experimental strategy may prove inadequate, and that they need to unlearn the knowledge accumulated at home after offshoring implementation, in order to accommodate for the high uncertainties of operating in the offshoring locations. As the firm commences offshoring ($t = 200$), it will therefore experience a larger drop in performance compared to the scenario with no uncertainty, after which marginal performance begins to increase.

The impact of uncertainty to the experiential scenario is depicted in Figure 5.4. Here, it is evident that marginal performance up to the point of offshoring ($t: 200$) is equal to the scenario with no uncertainty (i.e., constant) as the firm does not commence any organizational

Figure 5.3 – Performance scenario 1 with uncertainty (experimental strategy)

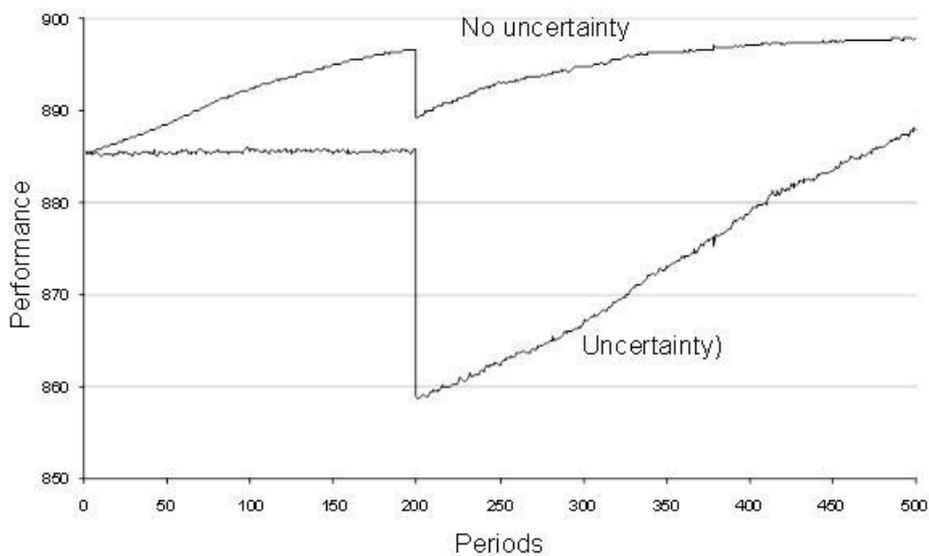
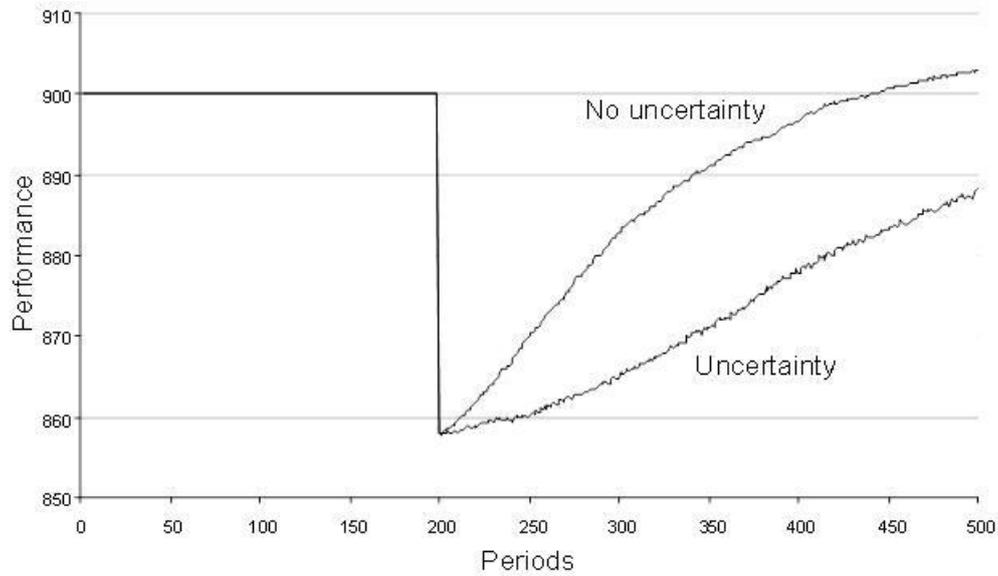


Figure 5.4 – Performance scenario 1 with uncertainty (experiential strategy)



reconfigurations with the purpose of increasing performance. After offshoring is implemented, it will, due to the added distance between the domestic and foreign activities, experience that the cost of coordination is significantly higher than prior to the implementation, and performance will drop. In contrast to the scenario with no uncertainty, however, the firm will experience that the subsequent increase in marginal performance (as it begins to test different configurations as the increased coordination costs have been encountered) is lower than in the scenario with no uncertainty. Also here, the increased uncertainty creates more noise in the performance function which overwhelms the coordination costs. Accordingly, performance suffers as the firm finds it more difficult to evaluate the effects of its organizational decisions.

A contingency approach to offshoring

With these basic assumptions, how do the experimental and experiential strategies compare? The answer to this question depends on the free parameters of the model—distance, uncertainty, coordination costs, and modularity. Moreover, in the real world there is likely to be a significant variation in these parameters—some industries have higher uncertainty and rely on more tacit knowledge than others and some firms offshore to more distant locations and have more modular architectures than others. In order to derive the empirical implications of our model of adaptation in offshoring we perform a Monte Carlo simulation of our model and apply empirical estimation techniques to this data set.⁶ This allows us to see which values and relationships would be uncovered in empirical research if given that the variables in our model are measurable and if that model provides a reasonable approximation to reality. These results are reported in Table 5.1 and 5.2.

We can see from Table 5.1 that the independent variables, while mutually uncorrelated, correlate with the performance measures. The results of Table 5.2, Model 1, reveal interesting insights about the determinants of the attractiveness between the experimental and experiential strategy to offshoring. First of all, when distance increases, the attractiveness of both strategies decreases, but more so for the experiential strategy which is subjects to dispersed learning. Thus,

⁶ We generate observations by allowing our independent variables to take on different discrete values, including six values of k_{LB} ($\frac{3}{80}, \frac{6}{80}, \dots, \frac{15}{80}, \frac{18}{80}$), two values of d ($\frac{1}{3}, 3$), two values of σ ($\frac{1}{10}, 2$), and 11 values of x ($\frac{10}{20}, \frac{11}{20}, \dots, \frac{19}{20}, \frac{20}{20}$). Furthermore, since there is a stochastic element in the draw of the modularity matrix, we draw two such matrices for each value of x . In order to avoid multicollinearity problems and confounding effects in later regression models, we create a completely stratified sample as to their values of the independent variables, i.e. where all possible combinations of the independent variable values listed above occur. This results in a total of $6 \times 2 \times 2 \times 11 \times 2 = 524$ observations. This complete stratification approach enables us to create independent variables that are completely uncorrelated. For each observation, we run 500 simulations for the experimental strategy and 500 for the experiential strategy, and find the average accumulated performance for each strategy, recording both the absolute and the relative cumulative performance of the two strategies. As a robustness check we also conducted the simulation where we allowed the firm to take two activities and move them in pairs (and not just one activity at a time), but the results were qualitatively similar to the ones presented here.

Table 5.1 – Correlations-matrix (N=528)*

	1	2	3	4	5	6	7
1) Modularity (x)	1						
2) Coordination costs (Klb)	0	1					
3) Distance (d)	0	0	1				
4) Uncertainty (s)	0	0	0	1			
5) Accumulated performance – Experiential strategy	0.02	-0.65	-0.67	-0.05	1		
6) Accumulated performance – Experimental strategy	-0.01	-0.72	-0.49	-0.38	0.88	1	
7) Accumulated performance difference (experiential – experimental strategy)	0.03	-0.52	-0.7	0.18	0.95	0.68	1
Mean	0.75	0.13	1.67	1.05	396,435	414,086	-17,651
Std. Dev.	0.16	0.06	1.33	0.95	38,725	17,067	25,011
Minimum	0.5	0.04	0.33	0.1	298,885	369,045	-81,149
Maximum	1	0.23	3	2	448,521	447,405	23,381

*All coefficients above .09 are significant at 5% level of significance

with high distance between the onshore and offshore activities, firms benefit from searching for an optimal configuration prior to the offshoring implementation while the activities are still co-located. Specifically, when a firm decides to offshore activities to a location where the impact of distance on coordination is high due to factors such as institutional and cultural differences (i.e., Bartlett and Ghoshal, 1989; Martinez and Jarillo, 1989), an experimental strategy to offshoring will yield higher accumulated performance than an experiential strategy. These effects are in accordance with extant literature that argues that offshoring preparation—such as predefined corporate-wide offshoring strategies that ex ante articulate deliberate plans and guidelines for the

Table 5.2 – OLS-models (N=528)

	Model 1		Model 2		Model 3	
	Accumulated performance difference (experiential – experimental strategy)		Accumulated performance – experiential strategy		Accumulated performance – experimental strategy	
Modularity	4,512	4,512	4,482	4,482	-30	-30
Coordination costs	-203,173***	-203,173***	-394,721***	-394,721***	-191,548***	-191,548***
Distance	-13,189***	-14,979***	-19,478***	-19,961***	-6,289***	-4,982***
Uncertainty	4,617***	1,775*	-2,124***	-2,892**	-6,742***	-4,667***
Distance * Uncertainty		1,705***		460		-1,245***
Intercept	22,765***	25,749***	479,574***	480,380***	456,809***	454,631***
F-value	517***	432***	964***	772***	1,184***	1,044***
R-square	.798	.806	.880	.881	.901	0.909
F-test for increment in R-square	-	19.24***	-	0.87	-	44.30***

*, ** and *** indicates 5%, 1% and 0.1% level of significance, respectively.

adoption and implementation of offshoring activities—is generally positively correlated with actual performance (e.g., Heijmen *et al.*, 2008; Lewin and Couto, 2007; Massini *et al.*, 2010).

Hence:

Proposition 1: Increasing distance is positively associated with the relative attractiveness of the experimental strategy to offshoring.

Second, the results of Table 5.2 suggest that a similar effect occurs when the marginal coordination costs increase. For example, the successful coordination in a firm may depend on

costly face-to-face coordination (in contrast to formalized coordination mechanisms such as standardization and centralization) where employees need to be physically co-located to ensure joint work (e.g., research and development). This may be the case in industries characterized by tacit and complex knowledge, which is difficult and costly to communicate. In these cases, it is thus beneficial to search for an optimal organizational configuration while the activities are still co-located so that the activities requiring costly coordination are placed only in one country and not across countries. We thus propose the following:

***Proposition 2:** Increasing coordination costs is positively associated with the relative attractiveness of the experimental strategy to offshoring.*

Uncertainty has both a direct effect and a moderating effect on the impact of distance. To distinguish these two effects it is useful to compare the two strategies' profiles under high and low uncertainty. We see that the degree of uncertainty has a direct positive effect on the relative attractiveness of the experimental strategy. With increasing uncertainty in firms' technological landscape, noise in the profit function overwhelms the low coordination costs at home, leading to a situation of causal ambiguity (Lippman and Rumelt, 1982) where the firm cannot evaluate the effects of its organizational decisions. Contingencies such as product and organizational life-cycles or demand fluctuations may create increased uncertainty in the technological landscape which consequently undermines the decision maker's ability to effectively estimate and predict how to most effectively adapt in the context of offshoring. As such, in situations with high uncertainty surrounding the offshoring decision, firms benefit from choosing an experiential strategy to offshoring in which the successful adaptation would be the result of cumulative

learning by doing over long periods of time (cf., Nelson and Winter, 1982; Adler and Clark, 1991). Accordingly:

Proposition 3: *Increasing uncertainty is positively associated with the attractiveness of the experiential strategy to offshoring.*

Furthermore, we see that uncertainty has a positive moderating effect on the negative relationship between distance and the attractiveness of the experiential strategy to offshoring. Looking at the regressions for the individual strategies, we can see that this reflects a negative interaction between the two variables on the experimental strategy. While distance increases the costs of coordination after offshoring, uncertainty lowers the effect of learning at home leaving the firm more vulnerable to high coordination costs once it offshores, and hence results in a more negative relationship between distance and performance (Model 3). A similar negative moderating effect does not exist for the experiential strategy, which does not even attempt to learn at home, and hence this effect shows up as positively moderating effect on the relative attractiveness of the experiential strategy (Model 2). This leads to the following proposition:

Proposition 4: *The relationship between distance and the relative attractiveness of the experiential strategy to offshoring is positively moderated by uncertainty.*

The degree of modularity of the technological landscape does not seem to have any direct effect on the attractiveness of the two strategies. The coefficients on the relative and absolute attractiveness of experiential strategy to offshoring are positive, but not significant. Modularity

as an organizing principle has been suggested an effective tool to manage complexity (Sanchez and Mahoney, 1996; Baldwin and Clark, 2000). For example, Simon (1962: 482) argues that complex systems achieve more and are easier to manage if they possess hierarchical and ‘near decomposable’ structures. Since we hold the underlying technological landscape constant in the model, these results are therefore not unexpected.

5.5 DISCUSSION

In this paper, we have built a model that examines the performance implications of how firms adapt when relocating organizational activities to foreign locations (i.e., engaging in offshoring). Prior research suggests that firms adapt by using measures such as patching, recombination and reconfiguration of firm activities (Eisenhardt and Brown, 1999; Karim and Mitchell, 2004), resources (Henderson and Clark, 1990; Galunic and Rodan, 1998), and divisional boundaries (Hoskisson and Johnson, 1992; Birkinshaw and Lingblad, 2005). However, little offshoring research has embraced the insights generated from the literature on organizational change and reconfiguration to understand how firms optimize performance when relocating activities abroad. At the same time, it is not clear how firms’ adaptation efforts are influenced by factors such as the added distance between home and host countries as signified by offshoring.

Accordingly, we have modeled the process of adapting to an underlying technological landscape through the accumulating architectural knowledge in the context of offshoring. As such, we have modeled a firm that after a certain point in time relocates a number of activities to a foreign location. In this process, the firm needs to adapt to an underlying technological landscape by making incremental changes to the configuration by assigning and reassigning different activities to different organizational units. In order to do this, however, the firm needs

architectural knowledge to understand the components of the organizational system and how these interact (Baldwin and Clark, 2000; Brusoni and Prencipe, 2006; Ethiraj and Levinthal 2004a; Henderson and Clark, 1994; von Hippel, 1990).

Our results are two-fold: First, we portray how firms adapt in the context of offshoring. We do this by juxtaposing two knowledge accumulation strategies: *an experimental learning strategy*, in which the firm experiments and searches for an optimal configuration prior to the offshoring implementation while the activities are still at home; and *an experiential learning strategy*, where the firm searches for an optimal configuration after the actual offshoring implementation based on its experiences. We show that a firm pursuing an experimental strategy will experience a comparatively lower performance while the activities are still co-located, but this increases as the firm identifies configurations which reduce coordination costs. Conversely, a firm pursuing the experiential strategy will rather experience a significant drop in performance following the offshoring implementation when coordination costs become higher due to the added distance, after which it experiments with different configurations to increase performance. However, we also show that these general adaptation patterns are largely dependent on uncertainty, which to a large extent hampers deliberate learning efforts. With increasing uncertainty, the ability to evaluate the appropriateness of the architectural knowledge is undermined, and the likelihood of committing inefficient design decisions increases. Thus, growing uncertainties of offshoring leads to situation of causal ambiguity (Lippman and Rumelt, 1982) where the decision maker will find it increasingly difficult to separate the effects of their reconfiguration experiments from the effects of other influences, and thus unable to prepare.

Second, in order to derive empirically testable research propositions, we subject our model to a Monte Carlo simulation and apply empirical estimation techniques to investigate the

relative attractiveness of the experimental and experiential strategies, respectively. The results suggest that the attractiveness of the experimental strategy increases with distance and coordination costs, but that it decreases with uncertainty. As such, the effective adaptation within a given configuration needs not always be a result of cumulative learning-by-doing over time (Nelson and Winter, 1982; Adler and Clark, 1991), but can rather be planned ahead. However, as the uncertainty of offshoring to new locations increases, the attractiveness of the experiential strategy where the firm approaches offshoring as a learning-by-doing process grows. Moreover, we found that uncertainty has a positive moderating effect on the negative relationship between distance and the attractiveness of the experiential strategy. Thus, with uncertainty, firms benefit from learning-by-doing despite vast distances. These are interesting observations as they counter conventional wisdom on the value of preparation in offshoring (e.g., Heijmen *et al.*, 2008; Lewin and Couto, 2007; Massini *et al.*, 2010). Rather than assuming that firms preparing upfront by implementing predefined corporate-wide offshoring strategies with deliberate plans and guidelines for the adoption of offshoring activities are more likely to generate higher offshoring performance, our results suggest that in some cases it may be more attractive for firms to pursue a learning-by-doing strategy to offshoring, particularly if the uncertainty inherent in the technological landscape is high.

Theoretical implications

This paper set out by drawing on the literature of organizational reconfiguration (e.g., Eisenhardt and Brown, 1999; Ethiraj and Levinthal, 2004a; Karim, 2006; Zhou, 2011) to provide a more complete view of how firms relocate organizational activities to international locations. In this regards, the question of how firms adapt to underlying technological landscapes *given* the impact

of distance has been emphasized. In contrast to existing views on internationalization emphasizing how firms need to adapt to new foreign environments (Johanson and Vahlne, 1977; Lord and Ranft, 2000; Makino and Delios, 1996), the perspective taken in this paper rather stresses the performance implications of how firms gain architectural knowledge when going abroad. In particular, we argue that the added distance between organizational activities increases firms' coordination costs and that they must search for new configurations in accordance with the international dispersion in order to optimize performance. As such, besides accumulating local market knowledge (Johanson and Vahlne, 1977; Lord and Ranft, 2000; Makino and Delios, 1996), firms must also accumulate architectural knowledge (Baldwin and Clark, 2000; Brusoni and Prencipe, 2006; Ethiraj and Levinthal 2004a; Henderson and Clark, 1994). Future research could therefore to a larger extent acknowledge how distance impacts the interdependencies between organizational units when reconfiguring and how this eventually impacts performance (see also Kumar *et al.*, 2008; Srikanth and Puranam, 2011).

Moreover, this paper provides impetus to a paradox that firms face when choosing between an experimental and an experiential strategy to offshoring by emphasizing both the process before and after offshoring implementation as well the accumulated performance implications between the two strategies. This has important implications for research on offshoring and the global distribution of work (Contractor *et al.*, 2010; Manning *et al.*, 2008; Srikanth and Puranam *et al.*, 2011). Besides formally modeling a process of offshoring, we have articulated two distinct strategies to offshoring that each yield different performance implications based on a number of contingencies such as the marginal coordination costs, the impact of distance on firms' ability to coordinate international activities, and the role of uncertainty in firms' technological landscapes. It therefore becomes erroneous to presume either that firms that

invest more resources into preparing for offshoring generally perform better than firms that do not (e.g., Heijmen *et al.*, 2008; Lewin and Couto, 2007; Massini *et al.*, 2010) or that an optimal organizational adaptation is always the result of cumulative learning-by-doing (Nelson and Winter, 1982; Adler and Clark, 1991). In contrast, we suggest that the optimal strategy considers how offshoring alters the organizational configuration and takes into account both coordination costs, the comparative costs advantages between the two locations, and uncertainty. Moreover, we suggest that the firm's ability to identify the optimal organizational configuration for offshoring is subject to the accumulation of architectural knowledge and depends on the signal-to-noise ratio (i.e., coordination costs to the uncertainty parameter). In line with this, future research could therefore empirically investigate how decision makers accumulate architectural knowledge in the process of offshoring, and to what extent this is influenced by the uncertainty of firms' underlying technological landscapes.

More broadly, our study suggests that the task of accumulating architectural knowledge (Ethiraj and Levinthal 2004a; Henderson and Clark, 1990) presents firms with a paradox in which they need to balance the tradeoff between strategic rationales such as lower production costs in foreign locations and the changing costs of coordination when implementing such strategic rationales. In particular, we argue that uncertainty surrounding such decisions can lead to situations of causal ambiguity (Lippman and Rumelt, 1982), in which efforts to learn prior to implementation may turn out wrong and even counterproductive. While we examined this paradox in the context of a simulation study of offshoring, future research could empirically operationalize this by investigating which organizational and environmental contingencies are more relevant to how firms approach this.

Practical implications

These results have important strategic implications for firms that decide to internationalize and offshore. As we suggest, there is no clear-cut answer to whether one learning strategy yields higher performance than another. Thus, decision makers need to weight the choice to engage in offshoring upon several contingencies such as distance, coordination costs, modularity and uncertainty. For example, firms can take different measures to address coordination costs by replacing costly tacit coordination mechanisms such as pre-project familiarity among team members with more codified or ICT enabled coordination mechanisms (Srikanth and Puranam, 2011). Instead of relying on people-based integration mechanisms, firms can choose to implement more cost-effective information or formalization integration mechanisms (Kim *et al.*, 2003). Moreover, a crucial factor in offshoring strategy planning relates to the impact of distance on coordination. Obviously, this is a decision that is largely influenced by other factors such as cost levels, supply of qualified labor, and access to resources and markets. However, our study indicates that the choice between ‘near-shoring’ and ‘far-shoring’ (Carmel and Abbott, 2007) can have important performance implications stemming from how the organization configured.

As a result, the managerial task of preparing for internationalization and offshoring is not straightforward. For example, a decision maker may overestimate the impact of distance between domestic and foreign activities on coordination costs, and thus decide to pursue an experimental strategy by encountering costs of accumulating architectural knowledge at home, while it would have been more profitable to pursue an experiential strategy. However, by doing this, the firm would risk that some of the learning achieved at home can turn out to be irrelevant once offshoring has been implemented. Thus, rather than responding to actual coordination challenges, the firm would need to forecast and project future coordination scenarios while

activities are co-located. Yet, these scenarios may not reflect the actual coordination challenges in an international situation, and, as a consequence, the firm would need to ‘unlearn’ knowledge on optimal configurations once the activities have been relocated. Equally, an underestimation of the impact of distance between domestic and foreign activities on coordination costs may lead the decision maker to pursue an experiential strategy, even though the opposite would have been more profitable. This is amplified by situations in which short-termism and incentives for current profit maximization may lead the decision maker to pursue the strategy that yields immediate highest performance (i.e., the experiential strategy), while the experimental strategy might prove more profitable over time.

Concluding remarks

By presenting and comparing two different architectural knowledge accumulation strategies, this study has investigated the performance implications of firm adaptation in the context of offshoring. Obviously, our approach leaves us with substantial limitations, in which our parsimonious model may omit important factors that explain firm behavior. That being said, we believe that the clarity, ease of comparability, logical power and transparency offered by modeling (Harrison *et al.*, 2007) allows us to pinpoint central aspects of offshoring and organizational reconfiguration that are otherwise neglected in empirical research designs.

Chapter 6

Conclusion

6.1 SUMMARY

Guided by the research question—*what are the organizational consequences of offshoring?*—this thesis investigates offshoring as an organizational reconfiguration in which co-located activities are relocated to foreign locations. Whether firms offshore with the purpose of accessing resources or as a response to environmental pressures, this thesis argues that a consequence of offshoring relates to the increased need for coordinating and integrating globally dispersed activities. Unless the complexity of coordinating offshored activities is managed, the initial rationales of offshoring become jeopardized and the likelihood of failure increases.

The thesis consists of four research papers using various datasets and methodologies that investigate different aspects of the organizational process of relocating firm activities to locations outside the home country. The first paper (Chapter 2) argues that the organizational complexity of offshoring leads to ‘hidden costs’ of reconfiguring the organization when implementing activities abroad. Complexity subjects decision makers to bounded rationality and consequently undermines their ability to foresee and estimate the costs of offshoring (leading to cost estimation errors). However, it also is argued that the organizational design orientations of firms’ offshoring strategies and offshoring experience are positively moderating the relationship between complexity and cost estimation errors. With design orientation and experience, firms are more likely to anticipate and align offshoring complexity with corresponding organizational

structures and processes. Thus, organizational design orientation and experience nurture decision makers' ability to anticipate the costs of complex organizations.

The second paper (Chapter 3) follows up on the first paper by arguing that a consequence of the hidden reconfiguration costs is a negative impact on the process performance of the offshored activity. The opportunity costs of wrongly estimating reconfiguration costs negatively influence the process performance of the activity as the operations of the activity are likely to be disrupted by managerial responses to the cost estimation errors. However, it is also argued that the modularity of the offshored activities positively moderates process performance. Arguing that complexity and the increasing need for coordination are important sources of cost estimation failures, modularity offers an important mechanism to reduce the need for coordination when offshoring, and thus moderate the negative performance implications of cost estimation errors.

The third paper (Chapter 4) argues that firms' experience with particular offshoring implementations has a positive impact on the extent to which firms consider organizational objectives in their strategies. Since the organizational reconfiguration of offshoring encapsulates new architectural challenges and complexities, firms subsequently need to reintegrate the geographically dispersed organizational elements so that they can be supportive of the organizational objectives. Firms thus need architectural knowledge in order to identify and uncover how the distances imposed by geographies, cultures and institutions impact the interdependencies between organizational activities. As firms gain experience with the offshoring implementation and thereby accumulate architectural knowledge, firms increasingly understand the true nature of the organizational activities and the interdependencies between these, and will therefore acknowledge this in their strategies.

The final paper (Chapter 5) builds on the third research paper, but rather argues that architectural knowledge accumulation need not necessarily be a result of cumulative learning-by-doing, but can rather be achieved experimentally prior to the actual offshoring relocation takes place. The performance implications of the experiential learning strategy (learning-by-doing after offshoring implementation) and the experimental learning strategy (home-based learning before offshoring implementation) are then compared, and it is argued that when the increased cost of coordinating an international organization are higher than the gains of production abroad, firms benefit from accumulating architectural knowledge prior to the international reconfiguration. However, when the uncertainty of firms' underlying technological landscape increases, they are better off by choosing an experiential learning strategy. Moreover, uncertainty has a positive moderating effect on the relationship between distance and the attractiveness of the experiential learning strategy, as it lowers the effect of learning at home and leaves the firm more vulnerable to higher coordination costs once it goes abroad. As such, uncertainty signifies a lower signal-to-noise ratio which leads to situations of causal ambiguity, and the value of accumulating architectural knowledge through the experimental learning strategy is undermined.

Taken together, these papers regard offshoring as an organizational reconfiguration with consequences for aspects such as complexity, the interdependencies between organizational activities, decision making, performance, and architectural knowledge. The disintegration and relocation of organizational activities create complexity which, in turn, negatively impacts decision makers' ability to accurately estimate the costs caused by the organizational change from co-location to geographical dispersion (Chapter 2). While this has negative performance implications for the offshored activity (Chapter 3), factors such as organizational design orientation, modularity and experience are found to be important to reduce this negative impact.

In particular, firms' level of architectural knowledge is important to anticipate and align offshoring complexity with corresponding organizational structures and processes. Firms can either accumulate knowledge experientially through learning-by-doing (Chapter 4) or through experimental learning (Chapter 5). Thus, in order to understand why some firms fail when offshoring and others do not, these papers emphasize that the organizational consequences of relocating organizational activities to foreign locations entail complexities that require firms to invest additional resources in coordinating the offshored activities so that an efficient reintegration can be achieved.

Theoretical implications and future research

The findings presented in this thesis contain a number of important theoretical implications for future research. Specifically, this thesis contributes to the literature by 1) conceptualizing offshoring as an organizational reconfiguration; 2) stressing the hidden costs of offshoring; and 3) pinpointing the role and strategies of architectural knowledge in organizational change.

First, the conceptualization of offshoring as an organizational reconfiguration suggests that the organizational sphere needs to be acknowledged and incorporated into the analysis of offshoring. Much research has successfully established why firms offshore (Contractor *et al.*, 2010; Dossani and Kenney, 2006; Lewin *et al.*, 2009), the characteristics of the offshoring implementation (Demirbag and Glaister, 2010; Doh *et al.*, 2009; Hutzschenreuter *et al.*, 2011), and performance outcomes (Bertrant, 2011; Mol *et al.*, 2005; Nieto and Rodríguez, 2011). However, less attention has been devoted to the organizational design of offshoring. As is demonstrated in this thesis, the organizational design of offshoring is important to understand why some firms manage their offshoring activities better than others. For example, it is argued

that the disintegration and relocation of organizational activities results in additional complexities and coordination requirements that subsequently challenge the successful reintegration of the offshored activities. Thus, while performance can be determined by firms' ability to access low-cost labor in foreign locations, the argument put forth here is that for this to materialize firms need to manage the organizational consequences of relocating activities abroad. Future research could therefore look more broadly into what is actually signified by the organizational reconfiguration. Since this thesis relies predominantly on cross-sectional survey data, it omits an in-depth scrutiny of the actual process of both the offshoring reconfiguration and the decision-making processes leading up to the reconfiguration. Future studies could therefore use qualitative research designs to better address the actual process of implementing activities in foreign locations and how this impacts the organization.

More generally, by emphasizing the change from co-location to geographical dispersion, the findings of this thesis may contribute to research on organizational designs in complex environments (Brusoni and Prencipe, 2006; Ethiraj and Levinthal, 2004a; Nadler and Tushman, 1997). Particularly, it is emphasized that the process of offshoring may challenge the capacity of conventional organizational forms and structures to facilitate and safeguard globally dispersed operations. When engaging in offshoring, firms are required to implement coordination mechanisms that accommodate for the added distance between interdependent activities in order to reintegrate their activities. As such, it is argued that offshoring serves as an important empirical research ground to investigate larger organizational questions relating to organizational change, design, and integration. For example, the change signified by offshoring challenges firms' ability to manage organizational complexity, but also their estimation of organizational changes. While the research papers in this thesis have emphasized factors such as firms'

organizational design orientation, architectural knowledge and modularity to be of importance when offshoring, future research could aim to better understand the effects of other design alternatives and mechanisms that firms can use when faced with an organizational reconfiguration. Moreover, interdependencies can take many different forms (Thompson, 1967; Van de Ven *et al.*, 1976). There may also be substantial differences between interdependent agents and activities (Puranam *et al.*, 2012). Future research should therefore investigate more specifically how and between whom the interdependencies across distances occur. Finally, since offshoring require firms to reintegrate the relocated activities into the organization, a relevant research topic relates to the role of systems integrators, i.e., agents in the organization that “*lead and coordinate from a technological and organizational viewpoint the work of suppliers involved in the network.*” (Brusoni *et al.*, 2001: 613; Hobday *et al.*, 2005). In an organizational system consisting of a number of offshored components and entities, the systems integrators thus become the architect that integrates and coordinates the different capabilities and resources of the different actors into a final output. Future research could therefore investigate how distinct agents identify optimal governance and integration mechanisms in a geographically dispersed organizational system.

Second, the findings of this thesis have implications for ongoing research on hidden costs in offshoring and strategic decision making. In offshoring research, the idea of hidden costs is new and has predominantly been treated conceptually and anecdotally to underscore how offshoring might be more challenging than initially expected (e.g., Dibbern *et al.*, 2008; Stringfellow *et al.*, 2008). The findings presented here contribute to this research by theoretically and empirically pinpointing complexity as a main driver of hidden costs, showing how hidden costs deter process performance, and identifying how firms’ may manage hidden costs through

strategy orientation, experience and modularity. Future research could aim to better understand the actual mechanisms that make decision makers more or less able to foresee future costs of reconfiguration. Moreover, future research could endeavor to develop a stronger instrument of hidden costs. In this thesis, hidden costs are operationalized as the respondents' perceptions of the difference between the expected and realized costs of offshoring, using cross-sectional observations. However, retrospective views about initial expectations may be skewed and underestimated. Thus, a research design using observations collected before and after the offshoring implementation would have obvious advantages compared to the design used in this thesis.

More generally, the focus on hidden costs contribute to research on estimation in strategic decision making (e.g., Durand, 2003; Hogarth and Makridakis, 1981; Kahneman and Lovallo, 1993; Makadok and Walker, 2000; March and Simon, 1958). As a main function of strategic decision making relates to decision makers' accurate estimation of the costs of implementing strategic decisions, this thesis has demonstrated how complexity undermines managers' ability to account for all important decision factors which in turn increases the risk that certain performance-detrimental consequences remain hidden in the strategic decision-making process. This contributes to research that emphasize the inhibiting role of complexity in decision-making processes (Langlois and Robertson, 1992; Loasby, 1976; Nickerson and Zenger, 2002) by focusing on the role of the organizational context in decision makers' estimation ability (e.g., Durand, 2003; Hogarth and Makridakis, 1981; March and Simon, 1958) and, in particular, on how organizational complexity undermines decision makers' ability to account for costs of implementation.

Third, this research contributes to research focusing on the role and strategies of architectural knowledge in organizational change (e.g., Baldwin and Clark, 2000; Brusoni and Prencipe, 2006; Henderson and Clark, 1990). In particular, the findings of this thesis stress the importance of architectural knowledge in the offshoring process. Since offshoring signifies a change in the organizational configuration, firms need architectural knowledge on how the interdependencies spanning across geographies, cultures and institutions impact the organizational system in order to make effective design decisions. Moreover, rather than stressing local market knowledge in order to optimize international operations (Johanson and Vahlne, 1977; Lord and Ranft, 2000; Makino and Delios, 1996), these findings suggest that firms must also accumulate architectural knowledge. Future research should therefore to a larger extent acknowledge how distance impacts the interdependencies between organizational units when reconfiguring and how this eventually impacts performance.

Moreover, this thesis has explicated and compared two strategies to accumulate architectural knowledge. In this respect, it is argued that one must understand contingencies such as distance, coordination costs and uncertainty to determine the strategies' relative attractiveness. It may therefore be misleading to presume either that firms that invest more resources into preparing for offshoring generally perform better than firms that do not (e.g., Heijmen *et al.*, 2008; Lewin and Couto, 2007; Massini *et al.*, 2010) or that an optimal organizational adaptation is always the result of cumulative learning-by-doing (Nelson and Winter, 1982; Adler and Clark, 1991). Future research could therefore investigate more in depth the contingencies that lead to successful knowledge accumulation. For example, while different forms of experience and learning might contribute differently to organizational behavior and performance (Haunschild and Sullivan, 2002; Madsen and Desai, 2010), it has not been possible to disentangle different

facets of learning more specifically in this thesis. Future research could therefore investigate which types of experience and learning that contribute the most to the identification of organizational forms and structures in increasingly complex firms.

Concluding remarks

Much research has argued that offshoring requires new theories to explain the phenomenon as the practice breaks with established theories on international expansion (Doh, 2005; Kedia and Mukherjee, 2009; Mol *et al.*, 2005; Youngdahl and Ramaswamy, 2008). In this thesis, offshoring is rather regarded as an empirical context in which existing theories on international expansion and organizational design can be investigated, extended, and modified. The inherent challenges in changing the organization from consisting of co-located activities to dispersed activities make offshoring an important empirical field for investigating complexity and design in contemporary organizations. Thus, offshoring should not be dealt with in isolation, but rather be viewed as a phenomenon that can further more established theoretical fields of international business, strategic management and organizational design. According to Tallman (2010: 6), *“If we continue to look at offshoring and outsourcing as unique, isolated, modern phenomena, we will end up as catalogers and scolds, but with little to offer either to practice or, in the end, to scholarship.”* This thesis concurs with this statement by investigating offshoring in an organizational context.

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