THE ORGANIZATIONAL COMPLEXITY OF OFFSHORING AND ITS CONSEQUENCES: THE ROLE OF MODULARITY AND ORGANIZATIONAL LEARNING

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October 15, 2010

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ABSTRACT

Many firms are increasingly experiencing that the "hidden costs" of sourcing business tasks and activities might eventually undermine many of the benefits of offshoring. Through a set of propositions, this theoretical paper argues that these non-contractual offshoring costs can largely be explained by the organizational complexity of offshoring, defined by the level of value chain disaggregation and global dispersion. Moreover, drawing on theories of modularization and organizational learning, the paper argues that the benefits of organizational modularity grow in accordance with firms' degree of organizational complexity of offshoring. The recognition of the need and the mechanisms to undertake a successful modularization, however, is dependent on firms' prior experiences with offshoring.

Key words: Offshoring, organizational complexity, hidden costs of offshoring, modularity, organizational learning.

1. INTRODUCTION

Offshoring (i.e. global sourcing) has for many companies become the modus operandi when responding to an increasingly globalized competitive landscape (Doh, 2005; Lewin & Peeters, 2006; Lewin, Massini, & Peeters, 2009; Manning, Massini, & Lewin, 2008). Yet, it seems that the progression of offshoring practice has in many respects overhauled its conceptual understanding (Kedia & Mukherjee, 2009; Mol, van Tulder, & Beije, 2005; Youngdahl & Ramaswamy, 2008). For instance, Kedia & Mukherjee (2009: 251) argue that "The existing conceptualization of offshoring lacks depth, and despite its present and anticipated future growth, many scholars have bemoaned that it has not received adequate systematic research attention." Similarily, Doh (2005: 695) asserts that "there is considerable divergence over the causes and consequences of offshoring", and that "although offshoring is not new, its acceleration – real or perceived – may challenge established theoretical orthodoxy regarding the operation of the global economy generally, and management practice, in particular."

Being driven by motives as cost reduction, strategic resources and market proximity, firms in the process of offshoring are increasingly experiencing encountering extra non-contractual costs that obscure the overall quality and efficiency of the practice; "hidden costs" (Aron & Singh, 2005; Dibbern, Winkler, & Heinzl, 2008; Stringfellow, Teagarden, & Nie, 2008). The purpose of this theoretical paper is to explore how the organizational complexity of offshoring can be understood as source of the hidden costs, and how modularity and organizational can evaporate these. The surge of offshoring, and the consequently increased global dispersion of value chain activities, has particularly been paralleled by the tendency of firms to disaggregate their value chain activities which has allowed companies a disaggregated evaluation of which activities are best performed in-house, in partnership and/or abroad (Brusoni, Prencipe, & Pavitt, 2001; Tanriverdi, Konana, & Ge, 2007; Van Assche, 2008). Indeed, the very definition of offshoring requires an organization to be

partitioned and dispersed across globally distribution locations (Kumar, Van Fenema, & von Glinow, 2009). A consequence of these two inherent attributes of offshoring, however, is an increasingly complex organization that is more likely to encounter escalating unexpected non-contractual costs (cf. Anderson, 1999; Park & Ungson, 2001; Robson, Katsikeas, & Bello, 2008). Although offshoring related issues have been widely dealt with in the literature – the antecedents (e.g. Lewin et al., 2009; Maskell, Pedersen, Petersen, & Dick-Nielsen, 2007; Mol et al., 2005), the processes (e.g. Jensen, 2009; Kumar et al., 2009; Manning et al., 2008), and the outcomes (e.g. Dibbern et al., 2008; Doh, 2005; Lewin & Peeters, 2006) – we are not acquainted with any research that systemically deals with the organizational complexity of offshoring.

We argue that the concepts on modularity and organizational learning provide valuable insights to our understanding of offshoring as a surging business activity. The concept of modularity in management studies advocates structures of products, production systems, and organizations based on minimized interactions and interdependences between modules and maximized interactions and interdependences within them (Sanchez & Mahoney, 1996). Seeing firms as entities of interconnected tasks and entities (Grandori, 2001; Lawrence & Lorsch, 1967; Perrow, 1967; Porter, 1986; Thompson, 1967), we exert that offshoring organizations can be understood as links of modules across borders, and that they can be assessed according to their overall organizational architecture, the interfaces between the modules, and the standards of the individual modules (Baldwin & Clark, 1997; Baldwin & Clark, 2000).

Articulated through a set of propositions, the overall hypothesis of the paper is that complex offshoring organizations (defined by the degree of value chain disaggregation and global dispersion), require increasingly modular strategies to manage their offshoring activities for keeping escalating unexpected costs at bay. Due to the complex and undefined

nature of modularity, however, firms' recognition of the need and the mechanisms to undertake a modularization of a system are dependent on their degree of organizational learning; the accumulation of organizational design knowledge based on prior experiences with offshoring (cf. Argyris & Schön, 1978; Fiol & Lyles, 1985).

The contributions of this paper are thus three-folded: First of all, seeing firms as chains of interconnected modules, we offer a systemic view on the organization of offshoring by shedding light on the system architecture, the module interfaces and the standards management. Secondly, we argue that modularity positively impacts firms' offshoring activities by endowing these with the means to manage the complexity of offshoring. Lastly, by drawing on the notions of organizational learning, we posit that firms' ability to recognize and reinforce the benefits of modularization when offshoring is dependent on prior experiences.

1 THE GLOBAL DISPERSION AND VALUE CHAIN DISAGGREGATION OF OFFSHORING

Per definition, offshoring describes the process of firms' relocation of business tasks and activities across borders (Doh, 2005; Lewin & Peeters, 2006; Manning et al., 2008). By conceptualizing firms as entities of interconnected tasks and activities (Grandori, 2001; Lawrence & Lorsch, 1967; Perrow, 1967; Porter, 1986; Thompson, 1967), it becomes possible to view the process of offshoring as the relocation or sourcing of value chain tasks and activities abroad, either within the firm boundaries (captive offshoring) or with external partners (offshore outsourcing) (UNCTAD, 2004). This perspective asserts that the linkages and interdependences between the globally organized activities are important value chain stages themselves (Kumar et al., 2009; Porter, 1986). Moreover, many companies engage in offshoring through collaborative organizational forms like international joint-ventures where

the offshored activity is located with a co-owned enterprise by two different firms in the home and host countries (Aron & Singh, 2005). Other forms include international strategic alliances and networks (Child, Faulkner, & Tallman, 2005; Contractor & Lorange, 2002). Illustratively, an offshoring terminology could thus be made according to a continuum where archetypes captive offshoring and offshore outsourcing are located at each extreme. This perspective on the offshoring organization is thus in line with O'Donnell's (2000: 526) view on multinational corporations (MNC) as a "web of diverse, differentiated inter and intra-firm relationships", in which firm tasks and activities are globally dispersed.

Another inherent feature of offshoring (although less referred to in the literature) is the inherent disaggregation or 'fine-slicing' of firms' value chains, in which value chain activities are being broken down and fine-sliced into a larger number of component pieces from their broader categories (Brusoni & Prencipe, 2001; Mudambi, 2008; Tanriverdi et al., 2007; Van Assche, 2008; Zenger & Hesterly, 1997). For offshoring to occur according to this logic, firms must deconstruct or break up its value chain and devise appropriate interfaces between organizationally and spatially separated functions (Kumar et al., 2009; Tanriverdi et al., 2007). For instance, while research and development might constitute a distinct value chain activity for a firm, it does on a more disaggregated level comprise several more as well as less advanced activities ranging from blue sky research to standard patenting (Jensen, 2009). Equally, manufacturing can be disaggregated from the less advanced volume production to the more advanced processing of prototypes and niches. While some degree of disaggregation is obviously required for offshoring to occur, the continuing fine-slicing of value chain activities thus enables firms to more accurately identify the specific tasks which can be performed in-house domestically and which can be offshored (Apte & Mason, 1995; Sako, 2006). Sako (2006) distinguishes between two forms of value chain disaggregation in regards to offshoring and outsouring: vertical disintegration (i.e. when firms decide to buy rather than

to make an input in-house) and corporate functions unbundling (i.e. the outsourcing of business processes within corporate functions). On a more general level, Zenger & Hesterly (1997) argue that firms are vertically disaggregating their organizations into smaller, more autonomous units for a number of reasons, including the powerful performance incentives, advancements and sophistications of information and communication technologies (ICT), and innovations in organizational design and performance measures. This, the authors argue, "permit the selective intervention of market elements in hierarchy and hierarchical elements in markets" (Zenger & Hesterly, 1997: 209).

Arguably, the disaggregation of firms' value chains is then inseparable from the surge in the global dispersion of firms' business activities, as it can be understood as both an antecedent to it as well as a response to it. For instance, firms might offshore a greater number of activities after the value chain is disaggregated as these are more narrowly defined, and are thus easier to estimate the value of ex ante (Zenger & Hesterly, 1997). Firms might also respond to a globally dispersed organization by increasingly fine-slicing its activities as a means to restructure offshore activities in a most profitable manner based on prior experience (Apte & Mason, 1995). However, the discussion of their interdependences and chronological order is not dealt with in the present research as the focus is rather on the consequences of these two variables in a context of offshoring; namely the complexity and the subsequent additional costs related to this.

1.1 The Organizational Complexity of Offshoring

The combination of the growing global dispersion and value chain disaggregation in offshoring results in an increasingly complex organization. Simon (1962) defines complex systems as systems consisting of large numbers of parts with many interactions. Equally, Thompson (1967) portrays a complex organization as a set of many interdependent parts. It

should naturally be noted that there is a difference between ‘natural complexity’ and ‘unintentional complexity’ (Miguel Pina & Rego, 2010) As Ashkenas (2007: 101) notes, “large organizations are by nature complex”. Organizational complexity is a necessary consequence of interconnecting and coordinating each part of the organization, and is crucial for the holistic understanding of the organization *per se*. Unintentional complexity, on the other side, refers the type of complexity that creates consequences as organizational inefficiencies and inertia and lack of response capacity (Anderson, 1999; Park & Ungson, 2001; Robson et al., 2008). In the respect of offshoring, with an ever growing number of disaggregated organizational tasks and sub-components being sourced globally, the managerial task of coordinating a coherent chain of value creating activities and tasks becomes more intertwined and complex, and thus more complicated (Niederman, Kundu, & Salas, 2006). For instance, this can be seen in the challenge of establishing sound mechanisms for coordinating and integrating a vast range of tasks and activities, dealing with many cultural differences, and overcoming escalating communication costs and barriers to name a few. Following Thompson’s (1967) implicit assumption that organizations operate to reduce and manage the uncertainties linked to their sets of activities (Moldoveanu & Bauer, 2004), for the purpose of this research we define the organizational complexity of offshoring as the managerial challenge of coordinating a growingly disaggregated and globally dispersed organization. This definition fulfills Daft’s (1992) understanding of organizational complexity as the number of activities and subsystems, measured along vertical complexity (the number of level in an organizational hierarchy), horizontal complexity (the number of departments across an organization) and spatial complexity (the number of geographical locations). The value chain disaggregation, which can be divided into vertical disintegration and corporate functions unbundling (Sako, 2006), thus explains vertical and horizontal complexity, while the global dispersion relates to spatial complexity.

Obviously, for numerous firms, pursuing offshoring strategies has indeed been a prolific adventure in which organizational complexity has not made matters worse for companies. Benefits of offshoring have, among other virtues, been manifested in cheaper production in low-cost countries, proximity to strategic important markets, and access to knowledge and other strategic resources (Doh, 2005; Ferdows, 1997). At the same time, however, companies have also experienced that complexity of offshoring can entail other additional challenges and costs than was originally anticipated (e.g. Aron & Singh, 2005). For instance, when the aircraft manufacturer Boeing in 2004 announced the introduction of the new jet liners 787 Dreamliner, it commenced on the ostentatious task of coordinating the production of a brand new airplane consisting of 2,000,000 parts (in comparison, an automobile consists of roughly 15,000-20,000 parts) with more than 70 percent of the production outsourced to 900 first, second and third tier suppliers in nine different countries (Tang & Zimmerman, 2009). Not surprisingly, this resulted in a highly complex organizational architecture with consequences such as the large and unexpected coordination and communication costs required to carry out the project and the continuous postponements of the launch of the final aircraft.

This suggests that the process of offshoring certain business activities might imply new and unexpected costs, or, said differently, the costs of offshoring might be *hidden* as well as *visible*. The latter relates to costs as recruiting and training as well as infrastructural issues, and are rather straightforward to identify and calculate through contractual means. The former, however, refer to the non-contractual costs of offshoring and are obviously more difficult to identify and calculate ex ante due to their unpredictable nature. According to Dibbern, Winkler & Heinzl (2008), companies incur four types of non-contractual extra costs. First of all, offshoring implies requirement specifications and design costs which are associated with the costs of specifying and designing the exact tasks or activity to be sourced

internationally. Second, firms are presented with knowledge transfer costs relating to the extra costs of the communication of knowledge between the client and the vendor organization. Third, coordination costs are costs to coordinate and integrate the vendor and the client's resources to achieve a collective set of tasks and activities. Finally, firms encounter costs related to controlling and ensuring the performance of the offshored activity is in accordance with the objective.

To understand how the cumulative degree of global dispersion and value chain disaggregation is linked to the idea of the hidden costs of offshoring, Stringfellow, Teagarden & Nie's (2008) conceptualization of the drivers of the hidden costs in an offshoring context is interesting. The authors argue that the hidden costs of offshoring are organized around the intensity of interaction as well as the distance of interaction between the home and the host unit. The interaction distance relates to barriers to interactions derived from the differences in geographic locations, language and culture. As this variable deals with the spatial location of the offshored activity, it explains how an increased globally dispersed firm can encounter unexpected costs related to location, language and culture. The interaction intensity, on the other hand, describes the degree to which the offshoring companies interact with the foreign, either internal or external, partner, and is determined by the content (e.g. tangible/intangible; well defined/poorly defined) and the processes (e.g. production or delivery process; standardized or non-standardized; the need for judgment and interdependence) of the activities offshored. As a higher degree of disaggregation requires more intense interactions due to the act of coordination the relative larger number of tasks and activities undertaken (Zenger & Hesterly, 1997), this variable explains the new and unexpected costs deriving from the value chain disaggregation. This is logic is illustrated figure 1.

INSERT FIGURE 1 ABOUT HERE

In sum, while offshoring certainly provides potential advantages for firms, companies should also be aware of its "harsh realities" (Aron & Singh, 2005: 135). In particular, we argue that the complexity stemming from growing value chain disaggregation together with global dispersion increases the likelihood of firms to encounter additional non-contractual costs when offshoring relating to requirement specification and design, knowledge transfer, control and coordination. This leads us to the following initial proposition:

> ***Proposition 1***: The combination of firms' increasing value chain disaggregation and global dispersion results in more organizational complexity with consequences of additional non-contractual offshoring costs.

2 THE MODULARITY OF OFFSHORING

The argument made above necessitates us on the one side to architecturally conceive how offshoring organizations are designed, and on the other to understand how firms are managing these issues of complexity. In the following, we argue that by treating the firms as chains of *modules* that require interfaces, architecture and standard management (Baldwin & Clark, 1997; 2000) – hence drawing on the modularization literature – a comprehensive conceptual understanding of the complexity of offshoring is provided.

2.1 An Architectural Perspective on the Offshoring Organization

Simon (1962), in his seminal work on the architecture of complexity, asserts that the degree of structural complexity is critically depended upon the way it is described by its observer. The concept of modularity promotes structures of systems – be it products, production systems or organizations – based on minimized interactions and interdependences between modules and

maximized interactions and interdependences within modules. Sanchez & Mahoney (1996: 65) define modularity as "a special form of design which intentionally creates a high degree of independence or 'loose coupling' between component designs by standardizing component interface specifications." It thus relies on the concept of coupling to describe how firms and firm activities interact with each other within a network (Orton & Weick, 1990).

A modular system can be presented as the stark contrast to an integral system. As Ulrich (1995: 422) puts it: "A modular architecture includes a one-to-one mapping from functional elements in the function structure to the physical components of the product, and specifies de-coupled interfaces between components. An integral architecture includes a complex (non one-to-one) mapping from functional elements to physical components and/or coupled interfaces between components." Modularity is moreover a relative attribute of a complex system. This means that within the same system there might be several layers of analyses, thus also layers of modularity (Brusoni & Prencipe, 2001; Hoetker, 2006; Langlois, 2002). In an extensive literature review on the concept of modularity in management studies, Campagnolo & Camuffo (2009) identify three distinct levels of modularity, depending on the unit of analysis: product design modularity; production system modularity; and organizational design modularity. This analytical distinction is interesting in regards to offshoring for many reasons. First, it invokes a debate to what discrete which parts at which layer of the company are being offshored: A company can source a specific part – a module – of a product from another country (Ferdows, 1997). Companies can also offshore an entire production system module, such as the ramp-up production or the distribution of a given product (Agrawal, Farrell, & Remes, 2003). Lastly, a company can also choose to offshore an entire organizational function, like R&D, IT support or accounting (Dossani & Kenney, 2007). The focus of this research, however, is offshoring at the organizational dimension.

If we consider a company from a modular perspective, its organizational design can then be depicted along a continuum, ranging from being fully integral to fully modular (Mikkola, 2003; Schilling & Steensma, 2001). According to Schilling (2000: 1999), modularity is "a continuum describing the degree to which a system's components can be separated and recombined, and it refers both to the tightness of coupling between components and the degree to which the "rules" of the system architecture enable (or prohibit) the mixing and matching of components." However, it should be noted that it is not unproblematic to rank a system along a dyadic integral-modular spectrum as other factors may be equally significant, including the architecture with the standardized or customized interfaces, the function-to-component relationship, and/or the hierarchy of decomposition (Sako, 2003). In fact, Baldwin & Clark (1997; 2000) argue that a modular system consists of visible design rules and hidden design parameters. While the hidden design parameters deals with information and decisions that does not affect the overall design beyond the locale module, the visible design rules fall into three categories: First, the *architecture* is specifying what modules are be part of the system and what their functions are (and hence referring to discussion on integral and modular systems). Secondly, the *interfaces* are describing how the interfaces between the modules interact. Here, the distinction between pooled, sequential and reciprocal interdependency can be made (Thompson, 1967; Ven & Delbecq, 1976). Lastly, the *standards* act as a means for testing and ensuring the individual modules' match and coherence with the system design and with each others. This can be measures like quality controls, benchmark systems or KPIs.

The systemic logic of modularity is easily translated into the context of offshoring by simply regarding firms as complex systems of modules or fine-grained value chain components being located across borders. As any other value chain perspective (Porter, 1986), a general overarching architecture depicting the sequential process of value adding activities

from the initial input to the final output is required irrespective of the geographical location of the sub-components. These value-adding activities are interdependent on each other to various degrees, and thus require interface attention to describe and understand their linkages. And different measures to assess the value-adding tasks and activities' standards and conformity to the architecture must be implemented. Perceiving the offshoring firm with the systemic logic of modularity thus facilitates an observation and assessment of which of the overall architectural intention with the organizational systems of individual modules, how these modules interconnect and communicate, and what resources and mechanisms are required for their optimal functioning. In the remainder of the article, we thus compose the system of an offshoring organization as consisting of a number of *individual modules* carrying out the different business tasks and activities, the *interfaces* connecting these modules, and an overarching *architecture* depicting how all of the components play together. This logic of the three components of the offshoring organization is simplistically exemplified in figure 2.

INSERT FIGURE 2 ABOUT HERE

The figure shows a given part of an organization with four different value adding business tasks (modules) being located in four different countries. The modules are interdependent on each other, signified by the arrows, and it is here that their degree of loosely coupledness is thus defined. The overarching architecture depicting the modules and interfaces function is illustrated by the dashed square surrounding the modules.

2.2 A Strategic Modular Perspective on the Offshoring Organization

Besides drawing on modularity to understand offshoring systemically, we assert that modularity can also be perceived as a strategic organizational tool to manage the complexity of offshoring. Simon (1962: 482) argue that complex systems achieves more and are easier manageable if they possess hierarchical and 'near decomposable' structures: "On theoretical grounds we could expect complex systems to be hierarchies in a world in which complexity had to evolve from simplicity. In their dynamics, hierarchies have a property, near-decomposability, that greatly simplifies their behavior". Balwin & Clark (2000: 14) stress that "When a design becomes "truly modular," the options embedded in the design are simultaneously multiplied and decentralized. The multiplication occurs because changes in one module become independent of changes in other modules. Decentralization follows because, as long as designers adhere to the design rules, they are free to innovate (apply the modular operators) without reference to the original architects or any central planners of the design." Modularity can thus be perceived as a strategy for organizing complex systems and processes efficiently (Schilling, 2000).

Modularity as such was originally framed as a product design strategy aimed at defining a standardized set of interfaces among product sub-components (Brusoni & Prencipe, 2001). Among the first documented products using a modular strategy was IBM's System/360 computer launched in 1964 (Baldwin & Clark, 1997). Previous IBM (and other manufacturers') computers had all been designed with unique and one-off operating systems, processors, and software. This meant that when a computer was introduced, new and unique components and software had to be designed specifically for that computer. With the IBM System/360, however, came a system which promoted reconfigurability and compatibility between the computer's sub-components. This resulted in a product line of computers of different sizes which was suitable for different applications. More specifically, IBM

established a Central Processor Control Office that determined how the different modules of the System/360 computer should work together and what their overall function were. The different teams working within the modules had to adhere to these rules. The teams did also have full control of how they conducted their work within their respective modules, as long as it did not affect other modules negatively. The result of this new strategy was financial and commercial success for IBM, but also for its customers who could growingly reuse old software and applications – i.e. modules – in new computers.

Hence, through the standardization of the interdependencies between the modules, loose degree of component coupling, and a high level of reconfigurability in technical and organizational design, a number of firm-level advantages are allowed for (Brusoni & Prencipe, 2006; Ethiraj & Levinthal, 2004). Companies can, among other things, easier decouple and discorporate single modules comprising a system, which subsequently facilitates increased strategic flexibility (Sanchez & Mahoney, 1996; Sanchez, 2000). Companies are better positioned to identify the value added of each module more precisely (as their interfaces are standardized), and they can thus easier recognize which modules comprising core competencies and which do not (Mikkola, 2003). Moreover, companies can experiment with the module and architecture designs to increase the final value of the system (Langlois & Robertson, 1992). Mudambi (2008: 708) argues that "increasing modularization allows the firm to amplify its focus on narrower activities within the value chain associated with the highest value added, an approach which may be called 'fine slicing'." In sum, for a firm to become modular, it needs to specify major sequential and mutual interdependencies, acquire and articulate the knowledge needed to coordinate units' activities, and make measurement techniques available for measuring the output and quality of the self-manageable independent modules. Moreover, as suggested by Brusoni, Prencipe & Pavitt (2001: 613), firms' primary governance mechanisms become systems integration as opposed to market or vertical

integration. Systems integrators, they argue, are firms "that lead and coordinate from a technological and organizational viewpoint the work of suppliers involved in the network".

Therefore, given the theoretical benefits of modularity (which according to Worren, Moore & Cardona (2002) can be divided into its first-order effects (enabling a high number of product options; reduces the time of switching between options; and the cost of switching) and second-order effects (allowing parallel business processes; increases incremental innovation; and enables interactive and real-time market research)), the question becomes whether a modular organizational design can be used as a strategic design variable to manage the complexity of offshoring, and thus evaporate its negative consequences. In the following, we argue that, depending on the degree of interaction distance and intensity, it does so in three different layers of the organizational design: at the individual module/offshored task level; at the interfaces level; and at the architectural level (Baldwin & Clark, 1997).

As offshoring has an inherent geographical dimension, challenges and hidden costs are likely to emerge on the basis of the degree of global dispersion due to the relative geographic, language, and cultural distances, i.e. high interaction distance (Stringfellow et al., 2008). The greater the interaction distances between home and host country are, the more likely it is for firms to encounter hidden and unexpected costs when offshoring. Moreover, the costs of offshoring are expected to increase when the degree of value chain disaggregation is high as this requires more intense interconnectivity to the remaining in-house value chain activities (Zenger & Hesterly, 1997), i.e. high interaction intensity (Stringfellow et al., 2008). Pursuing a modular strategy – i.e. having globally dispersed and fine-sliced modules being relatively self-manageable with standardized and explicitly defined interface mechanisms and a loosely coupled systemic architecture (Baldwin & Clark, 1997; Sanchez & Mahoney, 1996) – would *ceteris paribus* overcome the magnifying effect of these challenges as it would provide the necessary means for managing the complexity of a globally dispersed and value chain

disaggregated company. The negative implications of the relative degree of vertical, horizontal and spatial organizational complexity (Daft, 1992) will be undermined as the modules will largely be self-manageable in an overarching loosely-coupled system. In order to understand how it does so, however, we need to discuss what modularity signifies at the different organizational layers, and how a modular strategy would overcome the respective hidden costs of offshoring.

First of all, in an increasingly complex organization, a major challenge at level of the individual modules is the act of internally ensuring and controlling its coherency to the overall architecture in which it is embedded as well as explaining and defining what the individual module is contributing with. Following Dibbern et al. (2008), these challenges thus relates to the hidden control and specification costs of offshoring. Lewin & Peeters (2006) report that the largest perceived risk among a large sample of offshoring companies is poor service quality (61% of the respondents), suggesting that inconsistency between client and provider is a major source of hidden costs. More modularity on the level of the individual modules (i.e. offshored business tasks), however, would imply a larger internal interdependency as well as independence from other modules in the system. For instance, Galunic & Eisenhardt (2001)inductively describe how the innovative and adaptive capabilities of autonomous business unit within a Fortune 500 company can be explained as sub-unit modularity. Moreover, Zenger & Hesterly (1997) suggest how self-managing business units in large corporations are to a larger extent being treated as individual economic units, controlled by an increasingly market-like governance structure. As a modular strategy would signify a sophisticated pre-design of the different modules' adherence to the overarching architecture, the roles and responsibilities would be clearly stipulated and the potential room for ambiguity and misunderstandings would decrease, and thus the risks of hidden costs.

Secondly, regarding the interfaces between the modules, a major source of hidden costs relates to facilitating and communicating a transfer of information and knowledge between the globally dispersed and disaggregated business units (Dibbern et al., 2008; Kumar et al., 2009). A high degree of tacit, non-standardized knowledge cause misalignment and misunderstandings between client and provider, and is intensified by the distance and intensity of the interactions between the units (Stringfellow et al., 2008). However, more modularity at the interface level of analysis would entail minimizing the interdependencies between the modules through a high degree of interface codification and standardization. Baldwin & Clark (1997; 2000) posit that the means of communication and interaction in a modular system is through standardized measures to ease the decoupling of individual modules. A modular strategy would overcome these challenges as the means and channels of the knowledge transfer would be designed ex ante to be highly explicit in order to minimize the interdependency between the modules. As the modular organizational design would signify more standardized and explicit interactions and interfaces between the modules, the potential room for ambiguity and uncertainty evaporates. Pursuing modular strategy would thus entail defining how and with which language the modules should communicate as well as which system of interpretation should be in place.

Lastly, a number of potential hidden costs are found at the architectural level. There are the control costs of ensuring and controlling coherency in the network of individual modules; the coordination costs of integrating and linking the globally dispersed network of modules; the specification costs in the process of explaining and defining what is required from the system and the individual modules; and the design costs of designing a holistically conducive system consisting of individual modules and their respective interfaces (Dibbern et al., 2008). More modularity at the architectural level signifies more ex-ante design rules defining the overall purpose with the system, its network of globally dispersed and

disaggregated modules, and the interfaces interconnecting these (Baldwin & Clark, 1997; Galunic & Eisenhardt, 2001). Sako (2003) proposes a thorough task-to-organization unit mapping at different organizational layers to manage an modular architecture. In essence, modularity at the architectural level signifies the role of the firm as system integrators (Brusoni et al., 2001). As a modular strategy would necessitate a systemic and holistic architectural approach to the design of the globally dispersed and disaggregated modules, the risk of these costs would diminish. The activities to be offshored are regarded as modules that require deliberate and explicit design rules to optimally interact and function in a larger, growingly complex organizational value chain system, and their likelihood of revealing and contracting unexpected and hidden costs would thus decrease. Based on the above, the following set of propositions is formulated:

> ***Proposition 2a:*** Firms with more modularity on level of the individual modules (maximized internal interdependency and independence from other modules in the overarching system) are likely to evaporate the hidden control and specification costs of offshoring.
>
> ***Proposition 2b:*** Firms with more modularity on the level of the interfaces (minimized interdependency between the modules through a high degree of interface codification and standardization) are likely to evaporate the hidden knowledge transfer costs of offshoring.
>
> ***Proposition 2c:*** Firms with more modularity on the architectural level (increasing system integration through a loosely-coupled system of globally dispersed and disaggregated value chain tasks) are likely to evaporate the hidden control, coordination, specification, and design costs of offshoring.

Common to the arguments of strategic modularity on the three organizational layers is thus the means it provides for managing and evaporating the negative implications of the relative scale and scope of firms' global dispersion and value chain disaggregation in the context of offshoring.

3 AN ORGANIZATIONAL LEARNING PERSPECTIVE ON THE OFFSHORING ORGANIZATION

We have thus far argued that firms can overcome the costs of offshoring by organizing their activities according a modular strategy. Offshoring can, however, be understood as the *process* of sourcing value chain activities abroad. While the modular perspective does provide a coherent systemic picture of the organizational system and how the organizational activities are interconnected, it does not reveal anything of how companies realize the advantages of pursuing a modularization strategy as well as mechanisms to undertake a sophisticated modularization of a complex system (Ethiraj & Levinthal, 2004). In this vein, Brusoni & Prencipe (2006) show how firms' evolving knowledge bases mediates organizational and technical change towards modular design rules. Mikkola (2003) suggests how learning-by-failure from an initial inter-firm architecture nurtures an increasingly modular architectural design. Therefore, due to the complex nature of modularity by itself, we posit that firms' recognition and ability to modularize a system is subject to organizational learning, which, according to Fiol & Lyles (1985: 811), can be defined as "the development of insights, knowledge, and associations between past actions, the effectiveness of those actions, and future actions." Said in other words, the principles of modularity become relevant as firms begin searching for new means of organizing their offshoring organizations as a result of their experience with the hidden costs of offshoring. It is thus in this process that firms learn how to most efficiently organize and design their offshoring activities.

The case of the LEGO Group, the world's fifth largest toy manufacturer, illustrates this thesis.[1] As part of a comprehensive restructuring process in 2004, the Danish company decided to offshore and outsource up to 80 percent of its production to external suppliers to reduce operating costs and supply chain complexity, as well as to gain proximity to key markets. Prior to this decision, the LEGO Group had carried out the majority of its production in-house with little documentation and standardization of the production related process. As selected, more narrowly defined, production tasks and activities were relocated to foreign partners, the LEGO Group increasingly learned the value of standardizing and modularizing its processes to ensure operating efficiency. For instance, the LEGO Group introduced in 2005 a deliberate sales and operations planning (S&OP) process to monitor and coordinate the different production facilities' roles, capacities and responsibilities in relation to the supply. Moreover, by standardizing its processes, the company saw the potential of reducing the number of organizational units that produced unique components for the products. However, at the same time, the company realized that the new organizational setup of increasingly globally dispersed and disaggregated activities was presenting new and unexpected costs, particularly related to coordinating and controlling the different units. Therefore, in 2008, the company announced that it would begin phasing out the outsourcing agreement in favor a possessing a network of dominantly captive offshoring units organized under the principles of modularity. In sum, the LEGO Group underwent an incremental learning process whereby it realized the most appropriate design mechanisms to manage its offshoring activities effectively.

Much literature on offshoring has already applied an organizational learning perspective (e.g. Carmel & Agarwal, 2002; Dibbern et al., 2008; Jensen, 2009; Manning et al.,

[1] The data for the illustrative case consist mainly of a set of semi-structured interviews with key stakeholders from the LEGO Group that were conducted by the second author of the article. Other secondary sources like newspaper articles and reports have also been used to achieve a comprehensive understanding of the case in question.

2008; Maskell et al., 2007). For instance, Manning et al. (2008) argue how the scope and organizational capabilities of offshoring increases according to the firms' incremental and experiential learning processes. Carmel & Agarwal (2002) propose an incremental chronological four stage model of offshore IT sourcing based on firms' prior experiences and knowledge. Empirical studies on outsourcing moreover suggest that prior outsourcing experiences sophisticate new outsourcing decisions (Gainey, 2003; Leiblein & Miller, 2003). Equally, much international alliance literature suggests that organizations learn to manage internal actions and inter-firm relationships as a result of prior experiences (Anand & Khanna, 2000; Dyer, 1998; Kale, Dyer, & Singh, 2002; Zollo, Reuer, & Singh, 2002). Subjecting offshoring firms' ability of modularization in the realms of organizational learning is thus in line much offshoring research suggesting how prior knowledge increments and enhances future offshoring decisions.

This argument needs further elaboration, however. While our main concern is organizational learning at the offshoring firm, or more specifically at the disaggregated activity being offshored, offshoring can be perceived as collaborative in nature. This signifies that learning in an offshoring context is a process occurring between the offshoring firm and a strategic partner, either internally in the company hierarchy (e.g. international subsidiary), market based (e.g. inter-firm collaboration), or something in between (e.g. joint-venture). In this respect, Child et al. (2005) present an interesting taxonomy of organizational learning (corresponding to Argyris and Schön's (1978) terms of 'single loop-learning', 'double loop-learning', and 'deutero-learning'). According to the authors, firms in alliances learn on three different layers: technical, systemic and strategic. Technical learning, the lowest level of organizational learning, refers to the acquisition of new specific techniques, and implies routine learning. Systemic learning concerns the introduction of new organizational systems

and procedures. Strategic learning involves changes in management mindsets and is thus contributes the most to the firm's competitive advantage.

To operationalize this taxonomy according to the ideas of modularity in an offshoring context, a hierarchical decomposition of the two concepts appears to present synergic grounds of interpretation. Adhering to the modular design rules (Baldwin & Clark, 1997; Baldwin & Clark, 2000), we firstly assert that technical learning relates to the learning within the independent modules (offshored task), to which they acquire new techniques and standards to increase their degree of internal interdependency as well as independence from other modules in the system. As a company encounters hidden costs in its offshored modular units, it will begin exploring different means to manage these costs. According to the argument for modularity, one of these means will then be to minimize the unit's interdependence on other module and to promote a larger degree of self-manageability within individual module.

Secondly, systemic learning transmits into learning on how to interconnect and transfer knowledge between the modules; i.e. at the level of the interfaces. More experience with the knowledge transfer costs of offshoring would thus mean more systemic learning, and this would result in minimizing the interdependencies between the modules through a high degree of interface codification and standardization Thus, while learning at the technical level relates to organizing the individual modules constituting the organization, systemic learning relates to how these modules are systemically interconnected in a larger value-adding network of globally dispersed and disaggregated value chain activities.

Lastly, strategic learning tells about how the company is learning on the architectural level. Through its encounters with the hidden costs, the company will growingly realize at an architectural level how a loosely coupled system can increase the final value of the system. Respectively, learning at this level relates to understanding as well as transforming the strategic rationale of the organizational design in favor of a loosely coupled system that

promotes both the self-manageable modules and the minimized interdependences that interconnect these. Common to these three layers of analysis is thus that increased experience with the different hidden costs of offshoring presents the firms with impetus of finding means of managing and reducing these costs which initiates a learning process on three different layers, hence reflecting the process whereby firms learn how to most efficiently organize their offshoring activities. We thus propose:

> ***Proposition 3a:*** Offshoring firms with a high degree of technical learning (encounters with the hidden costs of offshoring at the level of the modules) are more likely to pursue modular strategies internally in the modules.
>
> ***Proposition 3b:*** Offshoring firms with a high degree of systemic learning (encounters with the hidden costs of offshoring at the level of the interfaces) are more likely to pursue modular strategies between the modules.
>
> ***Proposition 3c:*** Offshoring firms with a high degree of strategic learning (encounters with the hidden costs of offshoring at the architectural level) are more likely to pursue modular strategies at the architectural level.

The outcome of firms' learning processes is the ability to modularize a system. In this respect, however, there is an obvious distinction between firms' realization of the need of modularity in high complexity contexts and the particular mechanisms required to undertake a modularization of a complex system (cf. March's (1991) discussion on exploration and exploitation in organizational learning). Put in other words, through firms' organizational learning from offshoring – be it technical, systemic or strategic – they will, on the one side, increase their ability to recognize the need of pursuing modular strategies internally in the modules, between the modules, and at an architectural level. On the other side, firms will increase their ability to successfully apply and assimilate the modular strategies internally in

the modules, between the modules, and at an architectural level. As was illustrated with the LEGO Group, the company explored the rationale of modularity by interacting with external foreign providers, and exploited the potential of modularity after reorganizing the network after encountering the new hidden costs. This suggests that offshoring firms should strike and maintain an appropriate balance between the recognition of the need of modularity and the recognition of the mechanisms of modularity to manage the complexity of offshoring, and thus avoid escalating unexpected non-contractual costs.

In sum, given the arguments of the previous sections – i.e. that firms will benefit from pursuing modular strategies to manage the complexity of offshoring – a more dynamical and processual conceptualization of the process of offshoring is therefore provided as an incremental process in which firms' ability to recognize and assimilate the benefits of modularization is dependent on their degree of organizational learning. This is the illustrated in the figure 3.

INSERT FIGURE 3 ABOUT HERE

As the figure depicts, the process that offshoring firms undergo in order realize the need for and mechanism of modularity (dependent on the degree of organizational complexity) can be characterized as an ongoing learning loop (Sanchez, 2000) in which firms incrementally undergo technical, systemic and strategic learning corresponding to the experiences with the costs of offshoring complexity of different organizational layers. The incremental outcome of this knowledge is a balanced absorption between the need for modularity and the use of modularity which is then fed back into the organizational design

process. Organizational learning should therefore be understood as the process of realizing an organizational design to manage the organizational complexity of offshoring.

4 CONCLUDING REMARKS

The growing magnitude of offshoring calls attention to how the processes of the practice unfold. As was stated at the outset of the paper, the conceptual understanding of offshoring seems to have been surpassed by the progression of the practice. The basic assumption of this paper has been that new perspectives are particularly needed to grasp the organizational complexity of offshoring which seems to pose new and unexpected costs to the firms. Particularly, we have suggested that offshoring research can be further advanced by drawing on the concepts of modularity and organizational learning to conceptualize why some firms are better at managing the complexity of offshoring than others: Faced with high organizational complexity through increasing value chain disaggregation and global dispersion, companies that that adhere to modular principles (i.e. loosely coupled organizational architecture) are argued to keep escalating expected and unexpected costs at bay. Firms' recognition of the need and the mechanisms to undertake a modularization, however, is dependent on their degree of organizational learning.

This is not to suggest modularity as a panacea against all forms of extra costs of offshoring, however. While we have explained the organizational complexity of offshoring, and thus the source of the costs of offshoring, exclusively through value chain disaggregation and global dispersion, other variables might be equally significant to which modularization might not be advantageous. For instance, Brusoni & Prencipe (2006) argue that a highly modular product architecture (in their case; product innovation in tire manufacturing firms) should, in fact, be followed by an integrated organization. In an equally manner, Sosa et al. (2004) posit that modular organizations might hinder organizations' ability to implement

novel complex product architecture. This thus links up to a discussion concerning the costs of modularity (e.g. Baldwin & Clark, 2003). For instance, it is assumable that some organizations have an inherently larger potential of modularization than others. The costs of experimenting and learning to realize the value of modularity in an offshoring organization might as well vary between and even within firms. In addition, we have emphasized the importance of the firm to act as a system integrator in order to efficiently modularize a system. However, the cost of commencing this role is a topic we have not dealt with in the present research.

A number of implications for further research are therefore suggested to illuminate these issues. We have argued that modularization is but one mechanism to manage the complexity of offshoring. By acknowledging the significance of organizational design as an important independent variable in offshoring research, many new questions open up. For instance, how is organizational design contingent on offshoring firms' performance? Is it possible to quantify the complexity of organizational architecture while acknowledging the interaction distance and intensity of offshoring? Moreover, by accrediting the organizations' learning processes a significant role in mediating the most appropriate organizational design to manage the complexity of offshoring, issues concerning how to foster and balance these processes become relevant. Finally, thorough qualitative and quantitative empirical scrutiny of the processes that offshoring firms undergo is required to eventually achieve a better understanding of this emerging phenomenon.

Figure 1: The need for modularity

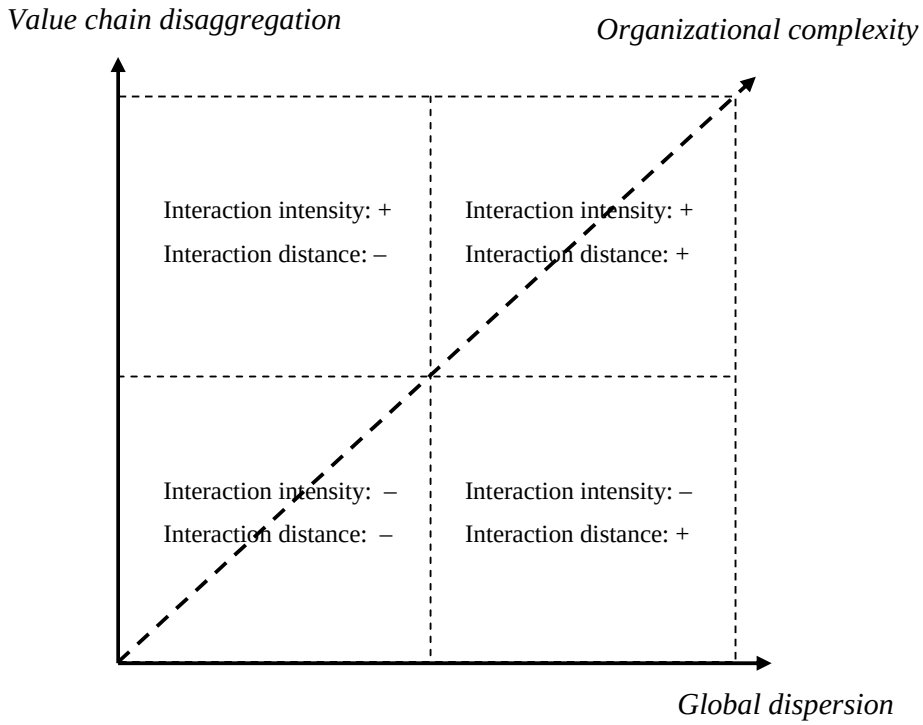


Figure 2: The components of an offshoring organization

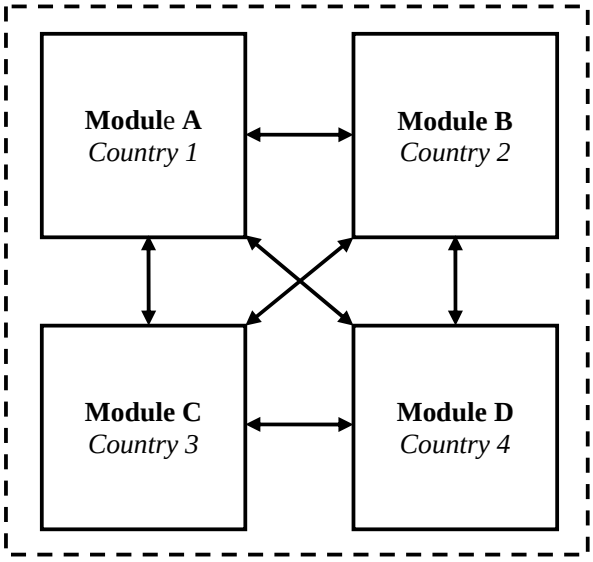
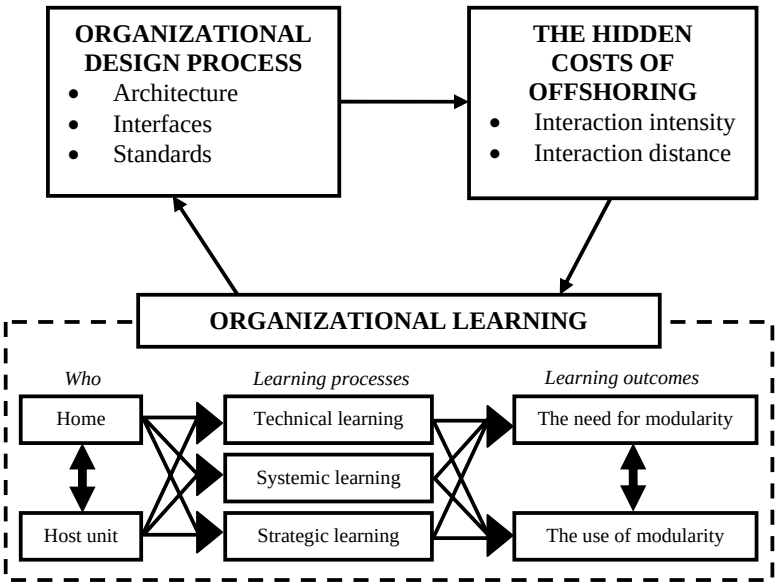


Figure 3: A dynamic learning framework for offshoring



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