

THE DYNAMICS OF IS ADAPTATION IN MULTINATIONAL CORPORATIONS: A NEW THEORETICAL LENS

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Abstract

The specificities of multinational corporations (MNCs) have to date not been a focus area of IS research. Extant literature mostly proposes IS configurations for specific types of MNCs, following a static and prescriptive approach. Our research seeks to explain the dynamics of global IS design. It suggests a new theoretical lens for studying global IS design by applying the structural adjustment paradigm from organizational change theories. Relying on archetype theory, we conduct a longitudinal case study to theorize the dynamics of IS adaptation. We find that global IS design emerges as an organizational adaptation process to balance interpretative schemes (i.e. the organization's values and beliefs) and structural arrangements (i.e. strategic, organizational, and IS configurations). The resulting insights can be used as a basis to further explore alternative global IS designs and movements between them.

Keywords: Multinational corporations, global information systems, information systems architecture, archetype theory, track, case study

Introduction

Globalization is a cornerstone of today's economies, and technological advances have significantly reinforced globalization. Ubiquitous access to global communication networks, notably the Internet, allows individuals and businesses to share knowledge and information almost instantaneously across the globe. For companies, this implies increasing participation in global markets, but also higher levels of specialization and distributed forms of organizing business operations.

Since the 1980s, globalization and the specificities of multinational corporations (MNCs) have been intensively studied in different management disciplines. A main research theme is the ongoing balance between global integration, local responsiveness, and knowledge transfer between subsidiaries (e.g., Bartlett and Ghoshal 1987; Ghoshal and Nohria 1989; Prahalad and Doz 1999; Roth and Morrison 1991). Despite IT's role in driving globalization, MNCs have to date not been a focus area of IS research (Lehmann and Gallupe 2005). In the 1990s, first studies explored the factors affecting global IS design and emphasized the fit between MNCs' strategies, organizational structures, and IS designs (Ives and Jarvenpaa 1991; King and Sethi 1999; Ramarapu and Lado 1995). Since then, researchers have investigated the IS configurations of specific types of MNCs (Boudreau et al. 1998; Ives and Jarvenpaa 1991; Karimi and Konsynski 1991; Ramarapu and Lado 1995), specifically emphasizing the configurations of enterprise resource planning (ERP) systems (Madapusi and D'Souza 2005; Markus et al. 2000). However, the proposed IS configurations are mostly derived based on conceptual insights and lack empirical validation or illustrations. In addition, the adopted contingency-based approach, by following a *prescriptive* and *static* approach, is unable to explain the de facto complexities and dynamics of IS adoption in MNCs. The existing studies are thus unable to explain how MNCs regain alignment in their global IS with the dynamics of changes and transitions in organizational beliefs over time (Lehmann and Gallupe 2005; Rolland and Monteiro 2002).

To overcome the aforementioned limitations, this study seeks to clarify how global IS designs emerge over time and how MNCs' IS configurations align with their strategic orientations. The main research question is: *How can we explain the dynamics of IS architectural design in MNCs?*

Building on organizational change theory, we suggest the structural adjustment paradigm, specifically archetype theory (Greenwood and Hinings 1988, 1993; Laughlin 1991), as a new theoretical lens for studying IS adoption in MNCs. Archetype theory allows us to explain the adaptive behaviors of MNCs to (re)shape coherence between strategic, organizational, and IS configurations by means of the concept of *tracks*, as well as identifying patterns of IS configurations by means of the concept of *archetypes*. Relying on this theoretical lens, we conducted a longitudinal critical case analysis in order to theorize the dynamics of global IS architectural design. We find that IS architectural design emerges as result of an organizational adaptation process in MNCs, in which companies establish coherence between their values and beliefs (interpretive scheme) and the adopted structural arrangements.

The remainder of this paper is structured as follows. First, we analyze the current status of research in both the management and the IS literature in order to define research gaps and clarify our study's contribution. We then examine organizational change theory and introduce archetype theory as the theoretical lens for studying the dynamics of IS adaptation in MNCs. The subsequent section motivates our research methodology and elaborates on case selection, data collection, and case analysis. We then present the case of Nestlé, applying the selected theoretical lens to analyze this critical case and to theorize the dynamics in global IS design. Finally, we synthesize our findings into research propositions. We conclude with a summary and future research outlook.

Prior Work

Over the past decades, we have witnessed constantly increasing global trade volumes, and most companies experience globalization as a primary trend in their industries. Globalization has led to

multinational corporations (MNCs)¹, i.e. groups of geographically dispersed subsidiaries that are capable of meeting local requirements by taking advantage of the reliable resources and a network of inter-connected business entities of an international corporation (Luo 2001). This section introduces the research streams related to MNC study in both management and IS literature. The goal is to map the raised issues and concerns in management literature with research directions in IS literature.

Management Research on MNCs

Research on globalization started in the 1980s, triggered by the political changes and the emerging markets, and has led to three interrelated research streams. The first research stream was initiated by Bartlett and Ghoshal (1987), who argued that organizations will be most competitive if they **simultaneously meet the challenges of global integration, local responsiveness, and learning** (knowledge transfer across locations). By means of *global integration*, companies build efficient operations networks across countries to take advantage of maximum commonalities across subsidiaries in different locations. *Local responsiveness* implies local differentiation of subsidiaries to address local cultures and markets and allows subsidiaries the freedom to manage their local businesses with minimal direction from headquarters. *Learning* concerns knowledge transfer to and between local units to manage the product lifecycle efficiently and effectively. The struggle to balance these three strategic demands in the globally competitive environment shapes most of this research stream (Bartlett and Ghoshal 1999, 1987; Devinney et al. 2000; Doz and Prahalad 1991; Ghoshal and Nohria 1989; Luo 2001; Prahalad 1975; Prahalad and Doz 1999; Roth and Morrison 1991).

Table 1: MNC Typology Adapted from Bartlett and Ghoshal (1987)				
MNC type	Strategic demands in MNCs			Characteristics
	Global integration	Local responsiveness	Knowledge transfer	
International	Low	Low	Low	- Home country-based MNC - Subsidiaries are often free to adapt new strategies and products, but are mostly dependent on headquarters
Multinational	Low	High	Low	- Autonomous subsidiaries and market-oriented business configuration - Many business duplications
Global	High	Low	Only from headquarters to subsidiaries	- Shared resource management - Very centralized, which leads to an underestimation of local needs
Transnational	High	High	High (between all business entities)	- Standardize when feasible, adapt when possible - Preferred strategy, but very complex and difficult to implement

In the second research stream, researchers propose typologies of **MNC strategies** (Bartlett and Ghoshal 1999, 1987; Gankema et al. 2000; Leong and Tan 1993), which are derived from the level of global integration, local responsiveness, and knowledge transfer. The landmark study in this stream is also Bartlett and Ghoshal (1987) (Table 1). Their well-established MNC typology distinguishes three organizational strategies – *global*, *multinational*, and *international* – as the traditional means of organizing globalized enterprises. They also introduce the *transnational* organizational strategy as a new approach; this requires global integration, local responsiveness, and learning to take place simultaneously. In effect, subsidiaries in transnational MNCs play different strategic roles to reflect the differences in external environments and internal capabilities, and support the overall corporate orientation (Kim et al. 2005). MNCs may *transit from one strategy to another*, but the adoption of the transnational organizational model for a multinational enterprise is widely acknowledged as the preferred means of going global (Bartlett and Ghoshal 1999, 1987; Boudreau et al. 1998).

¹ In the literature, multinational, global, and international companies are used interchangeably (Cheung and Burn 1994). We use multinational corporation (MNC), since it is the most common term used to represent these types of organizations.

The third and most recent research stream examines different aspects of **subsidiary integration**, such as the headquarters-subsidiary relationship (Roth and Morrison 1992; Rutenberg 1970), and more recently, subsidiary-based innovation and knowledge transfer through subsidiaries (Hocking et al. 2007; Keupp et al. 2011).

IT's Roles in MNCs

The diffusion of IT has been considered a turning point in effective MNC management (Palvia 1997; Sambharya et al. 2005; Umanath and Campbell 1994). IT's strategic role in globally managing dispersed subsidiaries is underpinned by various studies that examine change in the MNC organizational model through IS (Markus et al. 2000), and IS strategic planning in the global context (Akmanligil and Palvia 2004; Mohdzain and Ward 2007). In MNCs, ISs are thus used to leverage global synergies (Finnegan and Longaigh 2002; Hanseth et al. 2001), to integrate business functions (Kim et al., 2003), and to manage cross-subsidiary similarities (Clemmons and Simon 2001). Nevertheless, the complexity of IS architecture and development in the MNC context has been frequently raised owing to the fact that priorities, technical issues, and managerial issues related to IS in MNCs are different to those of domestic companies (Mohdzain and Ward 2007; Tractinsky and Jarvenpaa 1995). As such, "classifying global system development projects as simply larger versions of their domestic counterparts is an oversimplification" (Akmanligil and Palvia 2004). Unlike domestic ISs, global ISs cross national boundaries and are exposed to wide variations in business environments (e.g., differences in language, culture, nationality, and professional management disciplines), availability of resources (e.g., availability of telecommunication equipment, fiber optic, satellite, etc.), as well as technological and regulatory environments (e.g., owing to differences in the type of government, economy, and social policy) (Karimi and Konsynski 1991).

Unsurprisingly, the research streams in global IS show some similarities to those in the management literature (Table 2). The **balance between global integration and local responsiveness** is mirrored by the trade-off between **coordination and control** in IS literature (Clemmons and Simon 2001; Finnegan and Longaigh 2002; Hanseth et al. 2001; Ives and Jarvenpaa 1991; Markus et al. 2000). Control, which is reflected in centralized ISs, ensures that behaviors of different business entities in MNCs are compatible and support common organizational goals, but also restricts the autonomy of local entities. Coordination, which is reflected in integrated ISs, seeks to manage interdependencies between business entities in order to minimize duplication and maximize compatibility. Rolland and Monteiro (2002) argue that overemphasizing local needs in IS design leads to ignoring similarities across local units.

Table 2: Research Streams into MNCs		
Research streams	Management literature	IS literature
Strategic balance in MNCs	Trade-off between global integration, local responsiveness, and knowledge transfer	Trade-off between coordination and control in IS design
Typology of MNC organizations and IS configurations	- Global, multinational, and international as traditional organizational forms - Transnational as the preferred organizational form of going global	- IS configurations, specifically for ERP, related to the MNC typologies - Global (core) systems vs. local systems (used by one or a few entities)
Subsidiary integration	- Headquarters-subsidiary relationship - Subsidiary-based innovation	- IS design in local vs. global context - IS planning and integration in MNCs

Concerning **MNC typology**, researchers have studied the fit between global business strategies, IS architecture, and competitive advantage (King and Sethi 1999, 2001; Ramarapu and Lado 1995). Even though King and Sethi (1999, 2001) proposed IS strategies in their own typology of MNCs, a great deal of research in this stream has been dedicated to suggesting proper IS strategies related to different forms of MNCs proposed by Bartlett and Ghoshal (Ives and Jarvenpaa 1991; Karimi and Konsynski 1991; Ramarapu and Lado 1995) (Table 3). By discussing four types of IS planning in the global context, i.e. centralized, decentralized, fairly centralized, and fairly decentralized, empirical studies have interpreted the IS planning structures in MNCs as centralized or moving towards centralized (Cheung and Burn 1994; Mohdzain and Ward 2007). Lehmann and Gallup (2005) introduce a two-dimensional model of international information systems (IIS) architecture. They distinguish between a "core" of systems, which

are common to all business entities, and “local” systems, which provide functionality-specific solutions to one or a few subsidiaries.

Table 3: IS Configurations for Different Types of MNCs			
Types of MNCs	IS configurations proposed by researchers		
	Karimi and Konsynski 1991	Ramarapu and Lado 1995	Ives and Jarvenpaa 1991
International	IOS/Linked databases	Undefined	Intellectual cooperation in global IT
Multinational	Decentralized IT management	Decentralized databases with local IT facilities	Independent global IT operations
Global	Centralized IT management	Centralized databases with central IT facilities and regional networks	Headquarters-driven global IT
Transnational	Integrated architecture	Distributed/Shared databases with interdependent IT facilities and integrative networks	Integrated global IT

The **subsidiary integration** research stream investigates IS planning for subsidiaries and their integration into headquarters. Specifically, it discusses IS design in the global vs. local context (Tractinsky and Jarvenpaa 1995) as well as the differences between MNCs and domestic companies (Mohdzain and Ward 2007; Tractinsky and Jarvenpaa 1995).

Finally, studies on **ERP in the global context** (Clemmons and Simon 2001; Davenport 1998; Hanseth et al. 2001; Kay 1998; Madapusi and D’Souza 2005; Markus et al. 2000) investigate the frequent use of ERP systems by MNCs to meet their large-scale and international information needs. By discussing ERP systems’ role in accelerating globalization in MNCs (Hanseth et al. 2001; Madapusi and D’Souza 2005), different ERP configurations have been identified (Madapusi and D’Souza 2005; Markus et al. 2000). The most frequently cited study (Markus et al. 2000) discusses four patterns for distributing financials and operations in multisite ERP implementations in MNCs, whereas other studies distinguish between single-instance (a single system running on a single database) or multiple-instance (multiple systems/modules running on multiple databases) ERP systems in large organizations (Koch et al. 1999; Sarkis and Sundarraj 2003).

Research Gap

According to MNCs’ unique management requirements, effective adaptation of technology is crucial for their success in the market (Keller and Chinta 1990). Nevertheless, practitioners often struggle with global IS design, and their projects have mostly been less than successful (King and Sethi 1993; Lehmann and Gallupe 2005). In contrast to the large number of empirical studies on MNCs in other management disciplines, we observe a general lack of academic publications on global ISs. According to Lehmann and Gallupe (2005), research on IS in international settings comprised less than 0.05% of IS publications in 2005, and our literature review reveals that this topic has not subsequently become a focus of IS studies. To summarize, it seems that the IS discipline treats MNCs mostly as extensions of single-national companies, and does not consider the unique technical and managerial issues associated with the different levels of global integration and local responsiveness faced by MNCs (Mohdzain and Ward 2007). We identified the following research gaps:

(1) Following a **conceptual and prescriptive approach**, the current research (i) mostly suggests specific IS configurations for specific types of MNCs, which are considered as contingencies, and (ii) the proposed configurations are derived based on conceptual insights and lack empirical validation; the most cited studies only conceptually discuss probable configurations in ERP implementation (Madapusi and D’Souza 2005; Markus et al. 2000), or address the need for business-IT alignment (Ives and Jarvenpaa 1991) in global settings. Whether companies follow these strategies has not been studied, nor has it explained why companies do not comply with the suggested IS configurations.

(2) The existing literature takes a **static perspective**, even though the necessity of studying the dynamics of global IS development and implementation has been highlighted (Lehmann and Gallupe

2005; Lehmann 2010). The linear/prescriptive models fail to account for the intertwining of complex change elements in different steps of adopting ISs (Hsiao and Ormerod 1998) in MNCs. Since MNCs are constantly dealing with the issue of balance between global integration, local responsiveness, and knowledge transfer (e.g., through changing roles of their globally dispersed subsidiaries), the existing research is unable to explain how MNCs regain alignment with the dynamics of changes and transitions in organizational beliefs over time (Lehmann and Gallupe 2005; Rolland and Monteiro 2002).

(3) Since prior studies **mostly date to the 1990s and early 2000s**, they emphasize operational systems, notably ERP systems. In the meantime, Internet and mobile technologies have been adopted and play an important role in customer-market relationships. They put more pressure on local adaptations and rapid implementation, while requiring additional IS architectural components. In view of emergent technologies and recent globalization dynamics, such as the growing shift towards the BRICS (Brazil, Russia, India, China, and South Africa), the suggested IS configurations risk swiftly becoming outdated or at least needing additional amendments.

Introducing a New Theoretical Lens for Studying IS Design in MNCs

To address these research gaps, we suggest the structural adjustment paradigm as a new lens in global IS literature. Our approach is inspired by *organizational change theories*, which are frequently used in the IS field to analyze the *organizational and IS designs and their changes* (Lyytinen and Newman 2008; Robey and Newman 1996; Sabherwal et al. 2001; Silva and Hirschheim 2007; Swanson 1994). The following section will first review the different approaches proposed and then motivate why we find that archetype theory provides the most suitable theoretical lens to explaining the dynamics of IS architectural designs in MNCs.

Background: Alternative Theoretical Lenses

Over the past decades, three main paradigms have been proposed for studying organizational design and its changes over time: gradualist, contingency, and structural adjustment paradigms. The **gradualist evolutionary paradigm** (Darwin's model of evolution) posits that changes in organizations occur along the same path (Parsons 1966). It results in generic approaches that are applicable independently of the context (Rackoff et al. 1985), often utilizing lifecycle or maturity model metaphors. Since the late 1950s, contingency theorists (Fielder 2005; Hersey et al. 2008; Lawrence and Lorsch 1967; Vroom and Jago 1988) have challenged the evolutionary perspective by finding that there is no best way of organizing and that different structures are required in different environments. According to the **contingency paradigm**, contingencies lead to a specific structure (Donaldson 1987). Along with critiques of the gradualist paradigm, contingency theory has been also criticized as being inherently static (Sabherwal et al. 2001). By providing instance and short-time snapshots, it prevents us from appreciating the real complexities of organizational adaptation (Miller and Friesen 1980). Several theories have been developed to emphasize organizational adaptation dynamics, which we refer to as the **structural adjustment paradigm**. They argue that studying organizational change should pattern changes in organizational design and encompass different theoretical lenses, such as the *punctuated equilibrium model* (Eldredge and Gould 1972; Van de Ven and Poole 1995), *structural adaptation to regain fit (SARFIT)* (Donaldson 1987, 1997, 1999), and *design archetype theory* (Greenwood and Hinings 1988, 1993; Laughlin 1991).

Archetype Theory

Archetype theory argues that organizational adaptation is a process that takes place over time, and that the response or adaptive behavior of organizations varies from one to another. It is therefore essential to discover the response behaviors – the elementary dynamics of organizational adaptation that could be structured in different *design archetypes*. From exploring alternative organizational designs, their development, and their transformation, organizational theorists have uncovered the twin concepts of (1) *design archetypes* as patterns of organizational designs and (2) *tracks* as the dynamics of archetypes' evolution, so as to adopt an effective archetype (Cooper et al. 1996; Greenwood and Hinings 1988, 1993; Laughlin 1991; Miller and Friesen 1980, 1978).

The design archetype concept is the basis of typologies and classifications in organizational theory and comprises *coherence* and *interpretive scheme*. *Coherence* concerns the occurrence of relationships between the main orientation of an organization and its structures and processes. It represents an organization's total design, which gives an organization its overall gestalt or configuration. *Interpretive scheme* contains beliefs and values about an organization's appropriate domain of operation (raison d'être), principles of organizing, and appropriate organizational performance evaluation criteria. Therefore, a particular interpretive scheme coupled with associated structural arrangements constitutes a *design archetype*. *Tracks* are temporal associations of an organization with one or more design archetypes (Greenwood and Hinings 1988; Laughlin 1991). Explaining configurations of interpretive decoupling and re-coupling, tracks address the loss of structural coherence and the displacement of underpinning interpretive schemes over time, thereby explaining the dynamics of archetypes.

Greenwood and Hinings (1988) suggested three archetype positions and four different tracks according to the lack/existence of coherence with the given interpretive scheme (Table 4). The archetype positions explain the type of coherence with the given interpretive scheme: (1) *archetype coherence*, where the adopted structure completely reflects the interpretive scheme; (2) *embryonic archetype coherence*, where the organization is either in the early stage of the adopted archetype or faces some design discordances; and (3) *schizoid incoherence*, where the organization is dealing with two contradictory archetypes. The study of organizational tracks becomes the mapping of movements between these three archetype positions, which can be explained as: (1) *inertia*, in the case of no movements between archetypes; (2) *aborted excursion*, where the organization reaches archetype coherence after elaborating the initially adopted archetype; (3) *reorientation*, where the organization reaches archetype coherence after adopting a new interpretive scheme and consequently a new archetype; and (4) *unresolved excursion*, in the case of failure in adopting an effective archetype after movements between different archetypes.

Table 4: Different Positions and Types of Tracks Adapted from Greenwood and Hinings (1988)	
Positions	1. Archetype coherence: structural coherence consistently reinforces and reflects the interpretive scheme. 2. Embryonic archetype coherence: structural coherence nearly reinforces and reflects the interpretive scheme, in which there is significant design element discordance in structural coherence. 3. Schizoid incoherence: structural coherence reflects the tension between two contradictory sets of interpretive schemes.
Tracks	1. Inertia: remaining the same archetype for a long period. In this case, structural adjustment is the only type of change and adaptation. For instance, <i>Archetype coherence 1</i> → <i>Archetype coherence 1</i> → <i>Archetype coherence 1</i> 2. Aborted excursions: still the same archetype, but with temporary fraying of the initial structural coherence. This brings about the embryonic archetype, but again moves back to the initial structural coherence with the same archetype. For instance, <i>Archetype coherence 1</i> → <i>Embryonic archetype coherence 1</i> → <i>Archetype coherence 1</i> 3. Reorientations (transformations): leaving one archetype and moving to another. In this track, a new interpretive scheme emerges with a different pattern of structural coherence. For instance, <i>Archetype coherence 1</i> → <i>Embryonic archetype coherence 1</i> → <i>Schizoid incoherence</i> → <i>Embryonic archetype coherence 2</i> → <i>Archetype coherence 2</i> 4. Unresolved excursion: getting blocked into competing battles between different interpretive schemes. This track could be an example of failed or resisted attempts at reorientation.

The underlying concept of archetype theory covers the different schools of thought in the structural adjustment paradigm. The punctuated equilibrium model implies that archetypes present organizational equilibrium states, and tracks are used to explain movement among them (Hinings and Greenwood 1989), which also enfold organizational adaptation to regain fit in the SARFIT approach. Archetypes have already been utilized to conceptualize patterns in different IS-related fields, for instance, IT culture (Kaarst-Brown and Robey 1999), ERP implementation (Kræmmersgaard et al. 2012; Parr and Shanks 2000), IS sourcing (Hirschheim and Lacity 2000), IT governance (Weill 2004; Xue et al. 2008), and IT-enabled strategic change (Hsiao and Ormerod 1998). We conclude that the structural adjustment paradigm offers a conceptually sound and promising lens to study global IS design in MNCs. By identifying archetypes and tracks, we would gain insights into organizational response behaviors and be able to explain the patterns and dynamics of IS architecture adaptation in MNCs.

Research Methodology

Case studies are well suited for and frequently used to study the design of global ISs, since they allow for investigating these systems as a contemporary phenomenon within its real-life context (Yin 2003 p. 13), in which “the focus is on understanding the dynamics present in single settings” (Eisenhardt 1989 p. 534). In line with our research objectives, a critical case analysis allows us to exploit *a well-formulated theory* (Yin 2003 p. 28–33) – the structural adjustment paradigm and archetype theory – as an a priori analytical framework (Paré 2004) to guide theorizing the dynamics of IS architectural design in MNCs. Using this theoretical lens not only provides a blueprint to effectively design the case study research, it also becomes a valuable means to generalize the results and theorize the phenomenon under observation (Yin 2003; Paré 2004).

Single-case studies are useful in a longitudinal study to examine how certain conditions change over time (Yin 2003 p. 41), which is in line with our theoretical lens of investigating the dynamics in adopting IS architectural designs. This helps us to become familiar with the phenomenon in its context (Benbasat et al. 1987), to provide in-depth investigation and rich description, and to provide a basis for developing explanations why the given phenomenon occurs (Darke et al. 1998).

Case Selection

In a single-case design, a case should be selected on the basis that it is *critical* (Dubé and Paré 2003) and represents a *unique* or *revelatory* case (Yin 2003 p.41). Selection of our critical case was driven by the research objective of studying a company where we can (1) observe diverging approaches in adopting global ISs (i.e. centralized and decentralized) and (2) analyze its adaptive behavior in moving between different approaches. We opted for Nestlé as a critical case owing to the fact that this large MNC is well known among practitioners and researchers for its move towards a single-instance ERP system. Selecting Nestlé allows us to apply a new theoretical lens, which we believe will be helpful for the future study of global IS, in a well-known case. Nestlé ended up with a centralized IS architecture² after moving between different approaches in a long endeavor. Since *centralized IS architecture is most likely adopted in more mature IS adaptation processes* (Mohdzain and Ward 2007), Nestlé provides a suitable critical case for our research.

Data Collection

The author team has had the opportunity to study Nestlé for approximately five years and to gather comprehensive empirical data from both primary and secondary data sources. This gives us a unique opportunity to gain insights and study the *dynamics of a long journey* towards adopting centralized IS architecture that comprises examining different intermediate configurations (e.g., decentralized and federated architectures). The primary sources consist of interviews conducted at Nestlé during prior studies by the authors, which focused on the company’s approach to enterprise architecture (EA) management. Data was gathered between June 2009 and February 2010 by means of semi-structured interviews with IS architects and managers, and complemented by document analysis. Intending to cover IS/EA-related issues for a long period of time, each interview was done by two researchers and lasted up to 150 minutes. The interviews were recorded and transcribed. Transcripts and collected documents were used to elaborate a comprehensive case write-up (25 pages) in order to summarize the empirical data into a consistent whole. This case write-up was used as basis for first analysis and was complemented by additional interviews in a recent thesis examining global IS at Nestlé.

As complementary data source and to allow for data triangulation, we analyzed a vast number of secondary sources reporting on Nestlé’s transformation from a decentralized to a centralized IS

² The centralized or fairly centralized IS architectures comprise one or a few integrated ISs with centralized databases (control of the integrated system by headquarters) and multiple modules (related to different business functionalities) (Heimbigner and McLeod 1985). They emphasize the common “core” of systems that are compulsory for all subsidiaries and users (Lehmann and Gallupe 2005) and are most often realized by ERP systems for enterprise-wide data and process integration (Hanseth et al. 2001; Madapusi and D’Souza 2005).

architecture. These secondary sources encompass published articles (Boersma and Kingma 2005; Mitra 2012; Rath et al. 2012), case studies (Killing 2003a, 2003b, 2003c; Laudon and Laudon 2008), and magazine articles (Bryan 2001; Echikson 2000; Konicki 2000; Shpilberg et al. 2007; Steinert-Threlkeld 2006; Wheatley 2001; Worthen 2002). We also used public presentations by Nestlé employees, interviews, and periodic reports to gather Nestlé's statements about the progress of its architecture transformation. This helped us identify different archetype positions (the coherence of adopted architectures with institutionalized interpretive schemes) and tracks (the movements between different architectures) over different time periods.

Data Analysis and Interpretation

Following the steps set out by Miles and Huberman (1994) as well as Eisenhardt (1989), the data analysis was structured into two phases: early analysis and coding as well as case analysis. In the first step, we developed a coding scheme based on applying the constitutive elements of archetype theory (i.e. interpretive scheme and coherence) in the study of global IS architecture (Table 5). The underlying values and beliefs must be isolated at the outset (Greenwood and Hinings 1988) so as to formulate an interpretive scheme. From top managers' statements in annual reports, press articles and interviews, and presentations, we coded their values and beliefs relating to globalization and the three strategic demands (i.e. *global integration*, *local responsiveness*, and *knowledge transfer*), but also about IS's role in achieving strategic balance between the aforementioned strategic demands as well as the underlying attitudes related to *control* and *coordination* in IS architecture. For assessing the coherence of the current interpretive scheme with the MNCs' *structures and systems* (Cooper et al. 1996; Pinnington and Morris 2003), we relied on the socio-technical approach to IS change (Lyytinen and Newman 2008). Accordingly, we coded structure and systems as multilevel constructs comprising IS, organizational, and strategic configurations, as well as the environmental context. The IS configuration captures the levels of coordination and control in IS architectural design, as expressed by the centralization and integration of the main IS components, specifically the core applications supporting business operations. The IS configuration is embedded in an organizational configuration, reflected by the subsidiaries' roles and the coordination, integration, and standardization of business processes across the local and global entities. The latter depends on the strategic configuration, notably global vs. local products, customers and suppliers, and the environmental context.

Furthermore, to better analyze the *adaptation process* in the given case, we relied on the underlying concept of **process theory**, which is used to examine how organizational change emerges, develops, and grows over time (e.g., Markus and Robey 1988; Mohr 1982; Pettigrew 1997; Van de Ven and Huber 1990). It enables researchers to understand the fact that IS adoption emerges unpredictably from complex social interactions. This is in line with archetype theory, which seeks to identify archetypes and different tracks in the archetype adaptation process. Process studies analyze three main components: antecedents, process, and outcomes. *Antecedents*, which trigger a process and shape its main specifications, consist of external contextual factors (e.g., economic, social, political, etc.) and internal contextual factors (e.g., organizational culture, etc.). *Process* is a "sequence of individual and collective events, actions, and activities unfolding over time in context" (Pettigrew 1997). Finally, *outcomes* (outputs) are the results of each process. Process theory helped us identify different processes (events) towards adopting the most recent archetype along with the given interpretive scheme and structural arrangement, the antecedents that brought about the emerged interpretive scheme in each process, and the outcomes resulting from the adopted structural arrangements. In other words, in each process (event) of the IS adoption journey, we coded antecedents (internal and environmental drivers to introduce a new interpretive scheme), outcomes (of the adopted system and structure), interpretive scheme (values and beliefs in both business and IS), and coherence (strategic, organizational, and IS configurations).

We finally compared our observations to the proposed three positions and four different tracks of Greenwood and Hinings (1988) (Table 4) to analyze (in)coherence between interpretive schemes and their related structural arrangements and to explain each archetype movement.

Table 5: Constitutive Elements of Archetype Theory and Application to the Study of Global IS Architectures

Constitutive elements		Archetype theory	Suggested application in our study	Evidences in the case material
Design archetype	Coherence	Organization's strategic orientation, reflected in the organizational structure, processes, and systems	Environmental context	Extracted from events in the competitive environment
			Strategic configuration	Extracted from the strategic decisions related to product portfolio, customer segments, and supplier base
			Organizational configuration	Extracted from the organizational structure comprising main business functions / processes and their integration / standardization
			IS configuration	Extracted from the core business applications and data, and their centralization / standardization
	Interpretive scheme	A set of values and beliefs about how to organize the given organization and evaluate its performance	A set of values and beliefs about global integration, local responsiveness, and knowledge transfer, as well as about IS's role in achieving the strategic balance	Extracted from the company's mission and value statements, statements by board members and management in the press, presentations and interviews, management actions, and initiatives
Tracks		The (evolutionary and/or revolutionary) changes to regain structural coherence	The (evolutionary and/or revolutionary) changes to the IS architecture to regain structural coherence	Extracted from analyzing the critical incidents as well as changes in the IS configurations to derive chains of events and their pertinent antecedents and outcomes

Case Analysis

Nestlé is one of the world's largest nutrition, health, and wellness manufacturing MNCs, and is represented in more than 194 countries, with 468 factories in 86 countries. In 2012, the company's sales amounted to 92.2 billion CHF, a net profit of 10.6 billion CHF was posted, and employees totaled 339,000. Producing more than 6,000 brands, Nestlé is divided into three geographic zones: (1) Asia, Africa, and the Middle East, (2) Europe, and (3) North and South America. Each zone is further divided into several regions and market organizations (also called markets), which distribute the company's products with some adaptations to local demands.

Nestlé traditionally operated on a decentralized business structure, reflecting the company's mission: to focus on national differences and customized products to respond to local needs. This approach allowed each local organization to conduct business and run IT autonomously. Around 150 local CIOs had decision-making power over architectural questions, solutions, and budgets, and all 6,000 employees involved in IS/IT topics were employed locally. Despite an attempt to standardize IS in the early 1990s, Nestlé realized in 1995 that it was using SAP R/2 ERP systems in 14 countries; each ran this system differently and used a different configuration and data format. This placed Nestlé in the position where, in the case of a global requirement or compliance issue, approximately 100 local IT teams needed to change their systems. At the same time, the amount of required local IT changes increased strongly and the approach caused huge maintenance costs owing to the many redundancies. From 1994 to 1999, the amount spent on IT went up from approximately \$575 million to \$750 million a year. In addition, differently configured supply chains, multiple methods of forecasting demands, and innumerable practices for invoicing customers were increasingly affecting business performance.

Facing increasing market pressure, Nestlé's executive board realized that allowing each local subsidiary to conduct business in its own way created enormous inefficiencies. It also prevented the company from leveraging global synergies, for instance, its purchasing power with global suppliers. In 2000, the board launched the GLOBE (Global Business Excellence) initiative, a \$2.4 billion project, to achieve global business integration by (1) establishing a shared business process architecture; (2) standardizing master data as a corporate asset; and (3) standardizing IS/IT worldwide to support the first two goals. GLOBE targeted all parts of Nestlé's business by involving 700 people (400 employees from 43 different markets as well as 300 consultants from SAP, IBM, and PwC) to create a "single source of truth" throughout the company. This initiative "is really a business initiative" and "[the company has] decoded the DNA of how Nestlé does business," according to the head of GLOBE. GLOBE also included the largest ERP implementation project worldwide, which involved an initial \$200 million contract with SAP and an additional \$80 million for consulting and maintenance. The latter sought to meld all aforementioned 14 ERP systems into one, based on MySAP.com, an Internet-based software, including Workplace, SAP R/3, BW, APO, EBP, and Knowledge Warehouse.

The initiative has been running for more than 10 years. On the business side, 91 Nestlé markets are operating with GLOBE processes, data, and systems, which covered 96% of sales functions, 806 manufacturing sites, 1,109 distribution centers, 594 sales offices as well as 169,000 users in 2010. This brought about better collaboration regarding cross-functional solutions, for instance, a reduction in its number of suppliers from 600,000 to 167,000. On the IT side, Nestlé introduced SAP ERP as single-instance system to enable group-wide process and data integration. The implementation and development speeds have been increased significantly. The rollout of applications to 40,000 employees was possible in a few weeks, rather than two years, as had been the case. In 2010, GLOBE achieved a worldwide upgrade with zero business disruption. Today, approximately 1,000 IS/IT people work at headquarters, and an additional 500 in the zone Regional Offices, while the local level only employs around 50% of the original workforce. The number of data centers decreased from 150 to 4 (one for each zone and one at headquarters), with 40,000 to 70,000 managed users per data centre. GLOBE's overall business case goal was to save around 3 billion euro. According to Nestlé, the program has exceeded this goal.

Notwithstanding the obvious advantages of the centralized IT architecture approach, local entities believe that the high level of global integration and standardization caused an increase in the time to implement local requirements, rather than a decrease, because: (1) a market-specific requirement causes a modification in global system, and (2) the global approval and development workflow brings about increased complexity. In this regard, the standardization of market-facing business processes is particularly challenging, and Nestlé has seen a number of regional or local approaches to implementing CRM systems. Although most of the projects since the start of GLOBE have been approached in a top-down way, Nestlé has sought to solve the aforementioned issues by running a bottom-up approach to encourage locally initiated technology and process innovations. "One of our biggest opportunities for growth lies in innovation," according to Nestlé's CEO. These initiatives have sought to follow a bottom-up approach and to encourage locally initiated technology and process innovations – in particular, related to CRM, Internet, and mobile technologies. By defining an architecture framework, Nestlé has sought to ensure that the locally developed solutions are compatible or can be extended to become global solutions. Its future challenge is to continuously develop the standardized GLOBE solution into truly innovative business processes, and to support mobility, flexibility, and agility.

Case Interpretation based on Archetype Theory

We found GLOBE to be a turning point in Nestlé's IS architecture. In its IS architecture journey, Nestlé experienced different *processes*; for each process, we analyzed: (1) the *antecedents* (internal and environmental factors) that contributed to the emergence of the given *interpretive scheme*, and (2) the adopted strategic, organizational, and IS configuration to support the emerging interpretive scheme as well as the *outcomes* of deploying the adopted *system and structure* (Table 6; Figure 1).

Until the 1990s, Nestlé had followed a completely decentralized IS configuration, so that each local unit had its own local systems. Approaching low levels of control and coordination in IS configuration, Nestlé operated its subsidiaries as if they were autonomous units functioning independently. We interpret this as an "archetype coherence," since this decentralized IS architecture matched the organizational and strategic configurations and reflected the given interpretive scheme, that is, the local focus of its business.

In the early 1990s, to manage IT costs, the company tried to standardize IT systems, but ended up with 14 different SAP systems. IT standardization did not generate the expected savings, but brought about rising IT costs along with redundancies and confirmed the inability to leverage business synergies. In this period, Nestlé experienced an “embryonic” stage to utilize a globally standardized approach in developing and adopting IT systems and bringing down IT costs, while each subsidiary had full local autonomy in business and IT decisions. This resulted in a movement to “schizoid incoherence” characterized by the tension between the institutionalized local autonomy approach and the willingness to manage IT costs at the global (group) level.

		Table 6: The Dynamics of Global IS Architecture at Nestlé		
		Before GLOBE (1990s)	GLOBE (started in 2000)	Current (since 2010)
Antecedents		- Local products for local markets - Local IT management - Standardize IT to decrease IT costs	Necessity of synergies at group level in both business and IT to decrease IT costs and increase business efficiencies	- The necessity of flexibility and agility to better support local requirements - The emergence of new technologies
Interpretive scheme	Values and beliefs	Autonomous business units (subsidiaries) to fit with local conditions and business cultures	- Globally integrated business - ERP system (GLOBE) to drive global integration and standardization	- Local responsiveness in a globally integrated business - Locally initiated technology and process innovations in a globally integrated business
	Strategic configuration	Localized products (global brands), local customers, and local suppliers	Localized products (global brands), local customers, and global suppliers	Localized products (global brands), local customers, and global suppliers
	Organizational configuration	Local business processes, with low global integration and standardization	Single set of business processes in sales, distribution, and production; global integration in procurement and financials	Definition of core (globally standardized) and edge (localized) processes
Coherence	IS configuration	Decentralized systems (150 local CIOs, 150 data centers), low levels of both coordination and control	One single group-wide ERP system, high control, and low coordination	One single group-wide ERP system; architecture guidelines for locally initiated IT solutions with emergent technologies
	Outcomes	- Market-oriented business and IT configuration - Business inefficiencies and high IT costs due to inability to leverage global synergies	- Business process standardization (globally developed best practices) - IT cost reduction - Increase in time to implement local requirements	No evidence as yet

From 2000, Nestlé underwent a significant *transformation* from decentralized business and IT management towards global business integration along with standardization in business processes and a centralized/single-instance system. This transformation was encouraged by the necessity of synergies at group level, to decrease IT spending, and to increase business efficiencies. This move corresponds to a *reorientation* track in archetype theory, characterized as an emergent interpretive scheme as well as movement from one extreme to another. At this time, the executive management team believed in standardized and integrated business processes as well as one group-wide ERP system managed and ruled by headquarters. Nestlé thus experienced a shift from one archetype to another so as to support the aforementioned emergent interpretive scheme. At this point in time, even though the strategic/organizational configuration balances local responsiveness and global integration, the IS configuration sacrifices local responsiveness in favor of global integration. We interpret this

transformation as “embryonic archetype coherence” in adopting a one-size-fits-all enterprise system archetype. The adopted IS configuration caused an increase in time to implement local requirements owing to the necessary approval process from headquarters and the modification of the global system with market-specific requirements. Since the latter underestimates the necessity of local autonomy, an improvement in the previously adopted archetype is required in the future to achieve archetype coherence. According to the issues raised by new archetypes as well as issues caused by the initial archetype, the target archetype coherence should be able to balance global integration and local responsiveness so as to support subsidiary-based innovation. It should also encourage coordination between different subsidiaries as well as between subsidiaries and headquarters (bottom-up and horizontal knowledge transfer). This is also encouraged by the emergence of new technologies that mostly concern front end applications in subsidiaries in relationships with local customers.

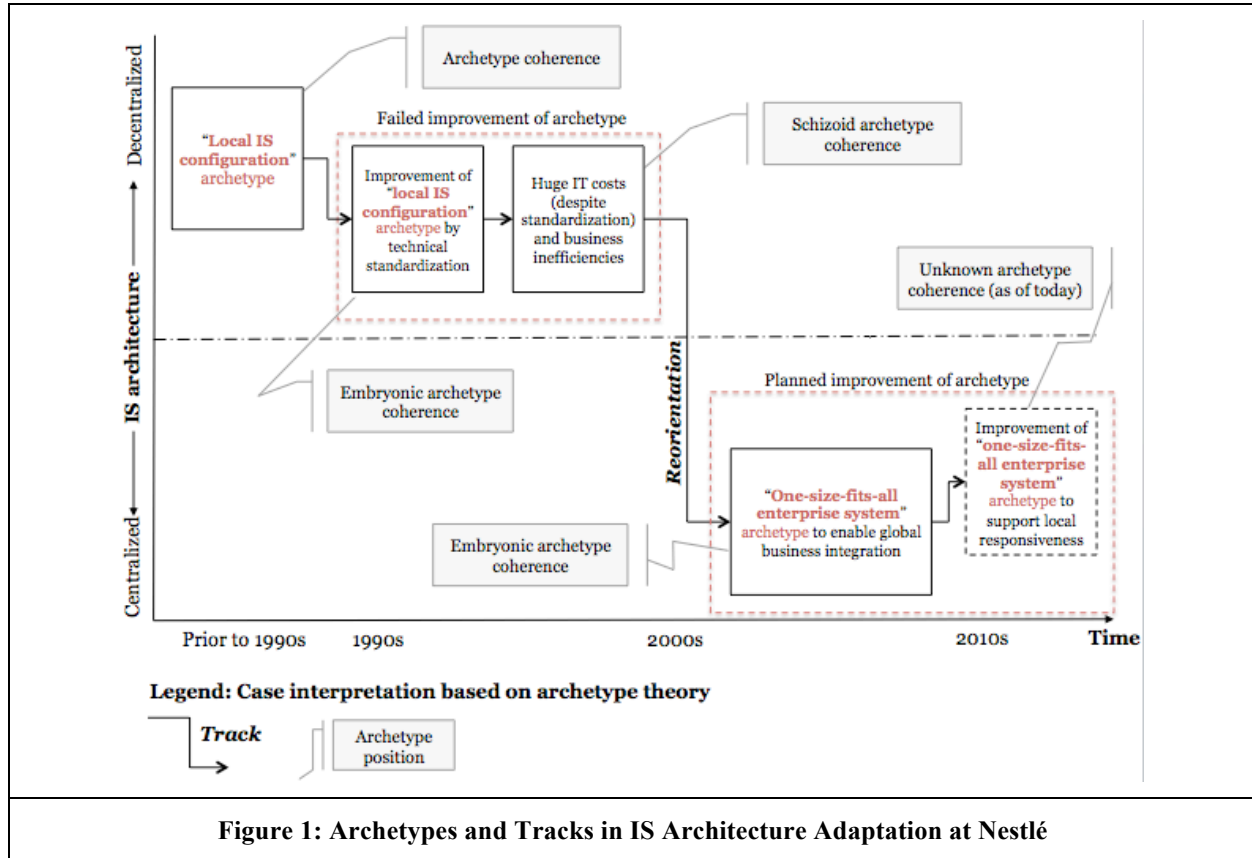


Figure 1: Archetypes and Tracks in IS Architecture Adaptation at Nestlé

Discussion

Our analysis illustrates, for the case of Nestlé, that archetype theory provides a suitable lens to synthesize the movements between different IS configurations in MNCs. In contrast to the prevailing contingency-based approaches, it explains the dynamics of global IS adoption, which continuously seeks coherence between the interpretive schemes and associated structural arrangements. This adaptation process also implies that an organization can move between different approaches over time so as to reach coherence.

Proposition 1: Global IS architectural design in MNCs emerges in an organizational adaptation process to balance institutionalized values and beliefs with the adopted systems and structures.

We find that archetype theory allows us to describe the modification, enhancement, and improvement of IS architectures to fulfill the constantly changing information needs of MNCs over time (Harmsen et al. 1994). It not only helps us identify coherent IS architecture configurations (*archetype coherence*), but also to understand adaptive behavior in early adoption phases of architectural changes (*embryonic archetype coherence*) as well as misfits in IS architecture design (*schizoid archetype coherence*) that lead to reorientation. In doing so, the explanatory power of archetype theory goes clearly beyond the

contingency-based approach, which is inherently prescriptive and static. We find that both schizoid and embryonic positions result in ineffective IS architecture configurations: the schizoid position brings about tensions due to inconsistencies in IS architecture approaches, while the embryonic position requires improvements. We therefore conclude with the following proposition:

Proposition 2: Establishing internal coherence between (1) interpretive schemes (values and beliefs) and (2) the adopted structural arrangements (strategic, organizational, and IS configurations) is a prerequisite for the effective exploitation of global ISs in MNCs.

A particularly interesting element of archetype theory is interpretive schemes, which we found to be a main factor in Nestlé's reorientation from a decentralized to a centralized IS configuration. As long as the interpretive scheme does not match the strategic, organizational, and IS configurations, companies risk remaining in embryonic archetype coherence or ending up in schizoid archetype coherence.

Proposition 3: The approach of adopting global ISs in MNCs is a function of constantly evolving interpretive schemes, which represent a set of values and beliefs about global integration, local responsiveness, and knowledge transfer as well as about IS's role in achieving the balance between these three strategic demands.

We could observe Nestlé's adaptive behavior when moving from a decentralized to a centralized IS architecture. Not only did we observe the issues of leveraging synergies in decentralized settings, we also found that this movement towards a centralized IS design is a very lengthy process and requires the adoption of new structural arrangements to support values and beliefs in centralized IS architecture.

In the terminology of archetype theory, moving from a decentralized to a centralized architectural design represents a *reorientation* track. Since this track brings about the risk of getting locked into competing battles between different interpretive schemes (*unresolved excursion* track), it is necessary to adopt centralization-related strategic, organizational, and IS configurations so as to support the emerging interpretive scheme. Furthermore, in establishing a centralized architecture, MNCs may experience *embryonic archetype coherence* and the need for further adaptation in a first phase. This is owing to the fact that this approach sacrifices local responsiveness for global integration and, as a result, underestimates subsidiary-specific (domestic) requirements.

Our case analysis also demonstrates that the focus on global integration and centralization risks underestimating the local specificities of subsidiaries. Hence, MNCs with centralized IS design face a continuous challenge to cope with local specificities and to encourage subsidiary-based business and/or technology innovation. Finally, the successful realization of global synergies (e.g., through technical standardization) in decentralized IS designs requires adjusting the given interpretive scheme and implementing federated structural arrangements.

Summary and Conclusion

In the research at hand, we took a dynamic (rather than static) perspective and applied the structural adjustment paradigm in organizational change theories, specifically archetype theory, to the study of global IS architectures. Our research exploits the aforementioned theory, as a theoretical lens, as well as process theory, as a nonlinear research design, in a longitudinal single-case study to analyze different IS architecture events and their related antecedents and outcomes over time. Our research's primary contribution is that it (1) explains the *dynamics of global IS adaptation (tracks)* and (2) provides a theoretically sound basis to identify *patterns in global IS architecture (archetypes)*. Archetype theory, as the suggested theoretical lens, allows us to synthesize the movements between different IS configurations in MNCs to fit constantly changing organizational values and beliefs over time. Our study thus explains de facto complexities and dynamics of business-IT alignment in MNCs, while integrating and extending previous research outcomes.

Our analysis illustrates that the suggested IS configurations for MNCs and the existing prescriptive and static approaches in IS research do not match the nature of MNCs. MNCs change their strategic orientations and organizational values and beliefs over time to balance global integration, local responsiveness, and knowledge transfer. Furthermore, the empirical studies have interpreted the IS planning structures in MNCs as centralized or moving towards centralized (Mohdzain and Ward 2007).

This movement was encouraged by the increasing penetration of ERP systems in MNCs. Nevertheless, our case analysis illustrates the challenges of centralized IS configurations in addressing local specificities and encouraging subsidiary-based business and/or technology innovation. The pressure towards local responsiveness is also reinforced by emerging technologies, notably Web 2.0 and mobile computing, which have changed relationships with customers, and have created and have led to innovations.

As implication for research, we suggest archetype theory as a new lens for studying the dynamics of IS designs and deriving the associated patterns (archetypes). In terms of research methodology, our research findings illustrate that the interpretative combination of archetype theory, qualitative case study analysis, and process theory provides a suitable research design to further study the dynamics of IS adoption. We encourage more research to examine how companies move between different archetypes, according to their contextual antecedents, and the outcomes of each movement. The archetype lens may also provide a helpful framework for studying specific categories of information systems and their adaptation in MNCs. As an example, knowledge management systems are of particular importance for MNCs when they move towards the transnational strategy. This strategic move implies facilitating bottom-up and horizontal knowledge transfer, that is, knowledge transfer between different subsidiaries as well as between subsidiaries and headquarters. It would therefore be interesting to further study adaptive response behavior when implementing knowledge management systems.

Practitioners can benefit from the results to better understand the process of adopting IS configurations in a global context. In addition, our findings may help practitioners and MNCs detect (mis)fits between an existing IS architecture configuration, the contextual strategic and organizational configurations, and values and beliefs. This will help them to shape their IT/IS strategies in order to balance global integration, local responsiveness, and knowledge transfer. These insights can also benefit IT vendors and consultants in shaping their software solutions and services.

The study's main limitation concerns the single-case research design. Even though we illustrated the dynamics of global IS adoption by an in-depth investigation of the selected case, further work is required to explore and empirically validate [an exhaustive set of] patterns (archetypes) of global IS configurations. We encourage qualitative and quantitative studies, to further investigate and empirically validate tracks and archetypes of global IS adaptations. Multiple-case studies (covering different IS configurations, such as centralized, decentralized, and federated) provide an opportunity to explore patterns (Pettigrew 1997) that can be used as a foundation for deriving archetypes and tracks. The ultimate goal can be defined as (1) exploring alternative global IS architecture designs (*generic IS archetypes*) as well as (2) understanding and illustrating different types of *tracks* that lead to specific archetypes. Furthermore, our study's scope was limited to the firm level, focusing on the *internal* coherence between interpretive scheme and structural arrangements. We acknowledge that, establishing internal coherence – as described in Proposition 2 – is a necessary but insufficient condition to effectively exploit IS in a changing marketplace.

Last, we briefly discussed the impact of emerging technologies on global IS architecture. The pressure towards local responsiveness is reinforced by emerging technologies, notably Web 2.0 and mobile computing, which have changed relationships with customers, and have created and have led to innovations. We thus suggest further study, to examine how the global IS architecture in general, and ERP architecture in particular, are affected in MNCs based on new technologies. The research goal can be defined as investigating the contribution of emerging technologies on IS's role in bringing about balance between global integration, local responsiveness, and knowledge transfer.

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