Technology assimilation through conjunctures – a look at IS use in retail

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Abstract We study the assimilation of information technology by an organization establishing itself in the emerging retail industry in India. We highlight the need for conducting a holistic analysis of the assimilation process that considers the role of various organizational actors, the socio-technical environment, the exogenous factors and the historical context under which the organization is operating. We adopt strong structuration theory, a refinement of Giddens' structuration theory, as the theoretical lens for studying the technology assimilation process. We combine this with actor network theory to incorporate the socio-technical perspectives. An organization in the Indian retail industry is selected as the empirical context. We analyzed the assimilation process as a series of conjunctures and illustrate how the socio-technical changes, the situated actions and the conjuncture's context influence the assimilation process. We also highlight the influence of historical context, and the role of organizational actors and actants in the technology assimilation process.

Keywords Strong structuration theory · Actor network theory · Technology assimilation · Retail information systems · Conjunctures

1 Introduction

Much literature in Information Systems (IS) aims to explain why and how information technology (IT) affects organizational life (Markus and Robey 1988). While researching the role of technology in organizations, it is not just adoption by individual users and their effective use of technology that is of interest, a topic of even greater importance is how organizations are able to assimilate technology (Gallivan 2001). Assimilation is defined as "the extent to which the use of technology diffuses across organizational work processes and becomes routinized in the activities associated with those processes" (Chatterjee et al. 2002, 66).

Most studies on organizational assimilation of technology have explored the impact of organizational factors that influence the assimilation process. Among the organizational factors, top management support has been identified as a significant factor in ensuring effective assimilation of technology, with researchers emphasizing aspects such as leadership qualities and practices (Armstrong and Sambamurthy 1999), the degree to which top management is able to influence the usage of the desired technology by the organization's staff (Liang et al. 2007), the strategic investment rationale, and extent of co-ordination exhibited by top management (Chatterjee et al. 2002), and the impact of their attitudes, behaviors and actions (Dong et al. 2009). Researchers have studied the role of top management in the assimilation of different types of technologies such as ERP systems (Liang et al. 2007), e-business (Chatterjee et al. 2002), and electronic procurements (Rai et al. 2009) to name a few. While top management support and attitude has been singled out as the most important factor, researchers have also analyzed the role of other organizational factors such as firm size, technology readiness, competition intensity, and regulatory environment (Zhu et al.2006). Another organizational factor that is seen to be playing an important role in the success of technology assimilation is the firm's absorptive capacity (Roberts et al. 2012) such as its organizational knowledge sharing (Chatterjee et al. 2002), learning capacity (Bharati et al. 2013), and the ability to recognize the value of new and external knowledge (Deng et al. 2008).

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While top management support and organizational characteristics are indeed important factors, researchers have noted the need for end-user involvement (Liang et al. 2007) and the role of the user perception (Chang et al. 2008) as influencing the assimilation of technology in an organization. Further, it is not necessary that the firm's senior leadership having the desired attitude and qualities will necessarily lead to effective assimilation of technology (Baskerville and Land 2004). Researchers have emphasized the role of technological, organizational, and environmental context as antecedents to the assimilation process (Zhu et al. 2006) that may nullify or reduce the influence that top management has on technology assimilation. Another important contextual factor that is often ignored in the technology assimilation study is the role of historical context, as Land observes : "the historiography of IS is important to understanding IS and its evolution through time, and that understanding even the most transformative, revolutionary, innovations benefits from the study of the historical context" (Land 2010, 385). Further, it may be observed that the organizational changes resulting from the technology assimilation process (Martinsons and Schindler 1995) may also in turn influence the ongoing assimilation process.

The prevalent method used for conducting technology assimilation research has been variance studies that adopt cross-sectional surveys. However, there is clearly a need for conducting longitudinal studies in order to explore the complexities involved in the assimilation process (Gallivan 2001) - such as the influence of historical context, temporal aspects, and the multi-dimensional impact of the assimilation on the organization and its people. It may further be noted that the complexities involved increase significantly when one expands the scope of the assimilation study to include enterprise-wide applications spanning longer durations of time. Conducting an analysis over a longer duration provides the opportunity to understand the assimilation process as an organization is adapting to different business strategies, addressing various market opportunities, and also being subjected to a variety of endogenous factors. Thus, to gain a better understanding of the technology assimilation process, it is valuable to conduct a rigorous, qualitative and longitudinal study of a single organization over a long duration. However, as we will highlight later, such a study poses significant methodological challenges.

The motivation for this research is to illustrate the contextual factors that impact the technology assimilation process and look beyond variables such as top-management and firm characteristics. To uncover these complexities, it is important to study both the micro and macro-level technology assimilation process over a long duration of time. To do so, we plan to study the process by which an organization assimilates IS, over a period of time, as it transits through organic growth, evolving context and changing technology.

The empirical setting that we chose for our study is an organization adopting ERP systems while it is establishing itself in the emerging retail industry in India. The complexity of the retail industry provides an excellent setting to study the contextual factors that impact technology assimilation. The Chinese retail industry has been the subject of an assimilation study where the researchers conducted a variance study of the technological, organizational and environmental context that impacts the ERP assimilation process (Zhu et al. 2010). Retail in India, particularly, provides us with a rich context as the industry underwent a series of transformations over the last two decades. The Indian retail landscape, particularly in the food and grocery segment, was predominantly an unorganized retail sector consisting of small "kirana stores" (Indian equivalent of mom-and-pop stores) run by individual entrepreneurs and small family businesses (Mukherjee and Patel 2006). The retail ecosystem was tuned to such a set-up with manufacturers having created large distribution networks that were able to cater to such a distributed market (Dholakia et al. 2012) where retailers used to stock merchandise in small stores that lacked in ambience, and consumers were tuned to purchasing in small basket sizes.

With the opening up of the Indian economy and increased consumer spending, large corporate houses entered the retail sector. The corporate houses introduced larger formats, established international retail practices that were supported by Information Systems, deployed professionally trained store staff to operate the stores, and engaged in offering merchandise at reduced prices to entice customers. The transformation from the unorganized sector to the organized sector was fraught with significant challenges (Dash and Chandy 2009): the entry of corporate houses into the retail sector was seen as a potential loss of employment to kirana shop owners and faced social and political opposition; the manufactures, fearing a loss in their bargaining power, were unwilling to collude with the modern format retailers; the consumers who were used to the personalized services offered by the neighborhood kiranas found it difficult to adjust to the new set-up; the unorganized sector had a significant competitive advantage because of low overheads and local market knowledge (Mukherjee and Patel 2006); and the dependency on technology was found to be a challenge owning to lack of proper infrastructure and lack of technology training of the store staff. The setting of Indian retail industry, thus, offers us a rich context to study the technology assimilation process as the case-organization struggled to establish itself in the emerging organized retail industry in India, and in the process experimented with technologies to accommodate the evolving retail practices.

The remainder of the paper is organized as follows. In section 2, we develop the theoretical lens for studying the macro-level technology assimilation process. In section 3, we elaborate the methodology and the theoretical framework

followed in our study. In section 4, we provide the empirical context of our study. We follow that by analyzing the empirical data using SST and ANT. While doing so, we demonstrate the role of structuration and the socio-technical elements in shaping both the technology and organizational structure during the adoption process. We conclude the paper by highlighting the key findings of our research work.

2 Structurational model of analyzing macro-level technology adoption

One of the outcomes of a technology assimilation process is the ensuing organizational change. The organizational change arising out of the technology assimilation process could be planned, emergent or episodic in nature. Organizational changes can come about as a result of either a "planned change" that is deliberately initiated and implemented by managers, or as a result of a "technological imperative" with the changes brought about by the use of technology - leading to organizational transformation (Orlikowski 1996). Further, the organizational change could follow an emergent pattern such as a "situated change" (Orlikowski 1996), an episodic one following a "punctuated equilibrium" model (Gersick 1991), or a combination of both (Tyre and Orlikowski 1994). An additional complexity is the socio-technical nature of the change (Lyytinen and Newman 2008) with the organizational systems comprising of interacting socio-technical components including tasks, structures, actors, and technology.

Analyzing organizational change as a result of IS assimilation is an important aspect of our research. As we argued in Section 1, the resulting organizational impact could be an antecedent to further assimilation. It is however difficult to observe organizational change as it occurs, since the changes are often situated in the actions of organizational actors and cannot be easily perceived. It is this challenge that structuration theory (Giddens 1984) is able to address well, as the theory provides a foundation to analyze the influence of institutional and organizational factors on individuals as they engage in the adoption process (Orlikowski 1992). However, application of structuration theory for studying macro-level technology assimilation is found to be challenging. First, structuration theory is a meta-theory and does not lend itself well to empirical studies (Stones 1996) and can at best be considered only as an analytical or sensitizing device (Giddens 1984). Second, studies using structuration theory do not adequately consider the evolution of technology due to exogenous factors: an added dimension that makes the structure-agency duality three dimensional and non-linear (Greenhalgh and Stones 2010). Third, the assumption of relatively homogeneous actors poses a challenge when the scope of the study includes groups of heterogeneous actors.

Fourth, while structuration theory lays importance on the mutual influence of structures and agency, the structures are also constituted by the historical, environmental and organizational factors that are bound to be at play during a macro-level structuration process. To address these challenges, we propose to use Stones' strong structuration theory (Stones 2005), along with the concepts of "conjunctures" and actor-network theory as the methodological lens for studying macro-level structuration processes.

2.1 Conjunctures

An objective of our paper is to consider the historical context that influences the technology assimilation process. We adopt the notion of conjunctures to explore the historical factors that yield influence on the assimilation process over time. We define conjuncture as a critical set of events or circumstances that delineate a landscape bounded by time, place and context. The term conjuncture is often used in historiography to describe the "..state of political-economic and especially class relations, in a specific society, at a particular point in time".[1] Rayward (1996) in his commentary on the history and historiography of Information Sciences defines conjuncture as "[…] cyclic social, economic, and technological movements or rhythms slow enough not generally to be perceptible to those who live through them but profoundly implicated in any attempt to understand historical developments" (Rayward 1996, 12). Our choice of using conjunctures to operationalize the temporal bracketing strategy is driven by strong structuration theory, our primary theoretical lens for studying the assimilation process.

2.2 Strong structuration theory

Strong structuration theory (SST) is an adaptation of structuration theory developed by Stones (2005). Stones argues that Giddens' structuration theory is positioned at an abstract level - what he terms as ontology-in-general. He suggests the need for introducing ontology-in-situ as: observing structures and action by agents in everyday occurrences of a conjuncture (Greenhalgh and Stones 2010). SST uses the notion of a conjuncture to delineate a landscape bounded by time, place and context, and imposes a certain set of structures under which agency unfolds.

SST also borrows Cohen's (1989) notion of position-practice to determine the networks and relationship between agents participating in a conjuncture. Position-practices are described as a set of structures and practices that a positional incumbent (managers, office staff, store staff etc.) can engage in. Such position-practices evolve over time, influenced by the historical and social forces operating on the conjuncture, and

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[1] As defined by encyclopedia.com.

in turn influence the structures of the agents participating in the conjuncture. SST develops a quadripartite model to empirically analyze the structures, agency and the resultant structuration through four components as outlined below and depicted in Fig. 1.
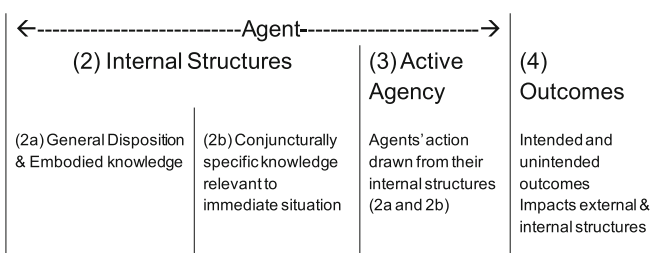
1. External structures: These are conditions of actions that are autonomous and external to the agent-in-focus and form the structural context of action (Coad and Herbert 2009). They may be acknowledged or unacknowledged (by the agent-in-focus) conditions of actions and may lead to intended or unintended consequences (Jack and Kholeif 2007). These structures may take the form of independent causal influences when the external structures are formed independent of the actions of the agent-in-focus. These structures may also exert irresistible external force when the agent-in-focus has the capacity to resist the force but is unable to do so (Coad and Herbert 2009).

2. Internal structures: These represent the agent's general-disposition or habitus and her conjuncturally-specific knowledge. The external structures applicable to the conjuncture is interpreted by the agent through her general disposition. The conjuncturally specific knowledge of the agent comprises of the knowledge of the specific context of action and is derived from the role or the position occupied by her (Stones 2005). This conjuncturally specific knowledge corresponds to the knowledge stock of interpretive schemes, facility, and norms as outlined in Giddens' structuration theory. The conjuncturally specific knowledge is based on the position-practice relationship of the agent-in-focus with the other agents-in-context.

3. Active agency: These constitute the actions taken by the agent-in-focus that are drawn either routinely or strategically from their internal structures (Greenhalgh and Stones 2010).

4. Outcomes: These comprise the intended or unintended consequences as a result of active-agency and lead to the external and internal structures being either preserved or changed (Jack and Kholeif 2007).

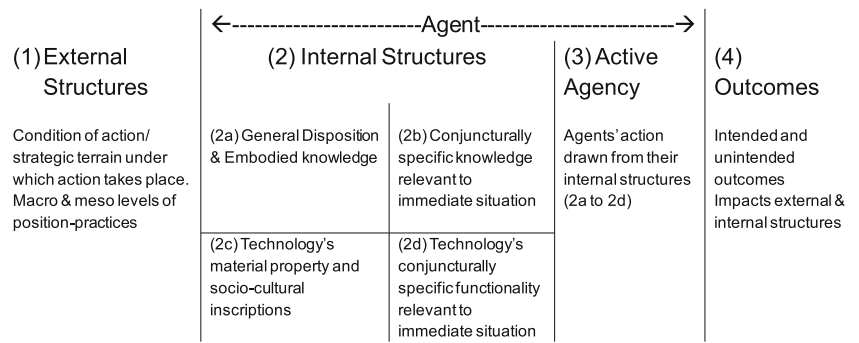According to SST, the act of structuration begins when the agent starts to engage in the specificity of a conjuncture (Coad and Herbert 2009) and uses her conjuncturally specific internal structures to do so. Agents bring in generic capabilities through their internal disposition and knowledge specific to a conjuncture. This capability determines how they are expected to act in a conjuncture and the possible outcome of their actions. However, how these agents will actually act in a particular situation also depends on a host of other factors that cannot be determined in advance: such as the constraints imposed by external structures and the actions of other agents holding different position-practices. The analytic framework provided by SST is through the quadripartite model that allows the study of the structuration phenomena at a meso-macro level - across multiple conjunctures and involving multiple sets of agents-in-focus. The SST framework, however, does not address the technology dimension explicitly which limits its applicability for assimilation studies.

2.3 Strong structuration and actor networks

Rose (1998), pointing out that Giddens' structuration theory does not address the technology dimension, argues for the need for combining structuration with other theories to make it suitable for the IS discipline. An example of such a combination of theories is the study of GIS implementation in India (Walsham and Sahay 1999) that combines structuration theory as a sensitizing device and Actor network Theory (ANT) as an empirical tool. Drawing motivation from this, Greenhalgh and Stones (2010) suggest incorporating the strength of ANT as a lens for studying technology driven changes to plug the gap in SST's analytical framework. They do so by including technical actants into their list of agents-in-focus and expand the concept of active agency to include actions taken by both actors and actants in a socio-technical network. Second, they expand the definition of internal structures to include ANT's notion of material inscriptions in technology. Thus, the internal structures which by SST include human agents' general disposition and conjuncturally-specific knowledge, is enhanced to include technology's material properties, socio-cultural inscriptions and the conjuncturally-specific functionality of the technology (Greenhalgh and Stones 2010). The resulting conceptual model developed by them is depicted in Fig. 2.

Greenhalgh and Stones' adoption of SST for studying socio-technical phenomena include a network of position-

Fig. 1 Quadripartite model of SST - adapted from (Greenhalgh and Stones 2010)

(1) External Structures	(2) Internal Structures		(3) Active Agency	(4) Outcomes
	← Agent →			
Condition of action / Strategic terrain under which action takes place Macro & meso levels of position-practices	(2a) General Disposition & Embodied knowledge	(2b) Conjuncturally specific knowledge relevant to immediate situation	Agents' action drawn from their internal structures (2a and 2b)	Intended and unintended outcomes Impacts external & internal structures

(1) External Structures	←-------------------------Agent-------------------------→		(3) Active Agency	(4) Outcomes
	(2) Internal Structures			
Condition of action/ strategic terrain under which action takes place. Macro & meso levels of position-practices	(2a) General Disposition & Embodied knowledge	(2b) Conjuncturally specific knowledge relevant to immediate situation	Agents' action drawn from their internal structures (2a to 2d)	Intended and unintended outcomes Impacts external & internal structures
	(2c) Technology's material property and socio-cultural inscriptions	(2d) Technology's conjuncturally specific functionality relevant to immediate situation		

practices that comprises of both human actors and technology actants (borrowing the term used by ANT for describing non-human actors). Active agency involves the use of specific technology by human actors in any given conjuncture. These actions are influenced by external as well as internal forces. External forces are exerted through independent institutional, political, economic, and technological structures and forms the external conditions of actions. Actions by human agents are influenced by their general disposition and conjuncturally specific knowledge while technology influences actions through its material inscriptions and conjuncturally specific functionality. Human agents, influenced by these internal and external conditions of actions, use the technology faithfully, unfaithfully, or refuse to use the technology altogether. Such actions, in turn, reproduce or change the social structures. This recursive relationship between structures, agency and technology is played at the micro level in the short-run and is visible at the meso-macro level over a longer time scale.

3 Method

3.1 Research site

Our approach was to first conduct a purposeful sampling (Patton 1990) to select cases that are information-rich and have the potential to provide insights into the core issues of macro-level assimilation process. We chose an organization operating in the Indian retail space as the research site for our study. Our choice was driven by the following considerations: a) retail is a mature industry in the developed countries and has well established industry practices and technologies; b) retail in India, however, was undergoing a transformation from the unorganized to the organized format and thus provided a strategic terrain that was undergoing temporal changes. The adoption of mature technologies that are inscribed with well-established practices by an organization establishing itself in the transitioning retail market in India offered a rich context for studying the technology assimilation process.
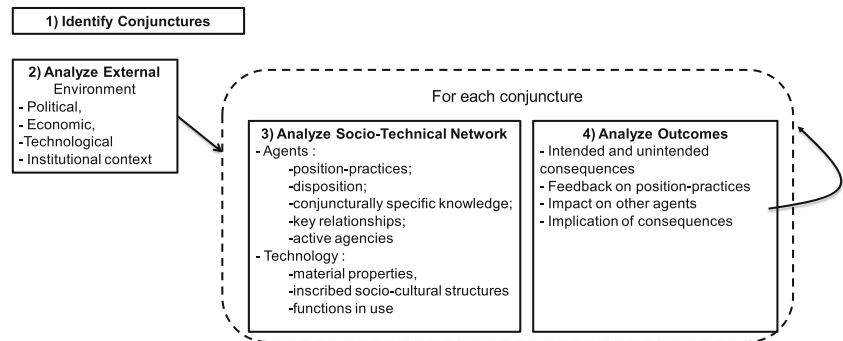
3.2 Research methodology

A case-study approach was adopted for our study. Historical information pertaining to the technology assimilation process was collected through semi-structured interviews and review of archival documents. Permission from the senior management of the organization was obtained to gain access to key informants. Interviews were conducted across a wide breadth of roles across the organization including business-unit heads, group-CIO, IT department heads, IT development/operations team and enterprise-staff. Since the historical data required for the analysis spanned over a long period of time, personnel who were employed with the organization through this period were included into the mix of respondents. Interviews lasted between one to three hours. Follow-up interviews were conducted in a few cases. While none of the interviews could be recorded, detailed notes were taken for each of the interviews.

As highlighted in Section 2, a key challenge is the long duration over which we are trying to analyze the macro-level structuration process. For studies involving multiple phases, a narrative strategy is often used for preparing the chronology and sequence of phases, and to establish the links between them (Langley 1999). Studies using temporal bracketing are often used to overcome some of the challenges of conducting an empirical study using structuration theory (Pozzebon and Pinsonneault 2005). Subsequently, in our study too, we provide a temporal view of our case to determine the different conjunctures over which the assimilation process is studied. We then use SST to evaluate these conjunctures using the quadripartite model.

3.3 Analytical approach

We adopt the guidelines provided by Greenhalgh and Stones (2010) as the analytical framework for our study. The analytical procedure followed is outlined in Fig. 3. As a first step, we classify the technology assimilation process into a series of phases or conjunctures. We apply the concept of conjunctures to temporally bracket the events into different sets that can then be empirically analyzed for structurational effects. It may be noted here that our adoption of the term conjuncture is not

Fig. 3 Theoretical Framework

determine the functions-in-use and how the inscribed structures enable, influence or constrain active agency. Next, we analyze the active agency performed by the heterogeneous set of actors participating in each conjuncture. The outcome of the agency is analyzed to determine the consequences (both intended and unintended) of these actions, the role of technology in producing these consequences, the corresponding feedback of these consequences on the position-practices and its significance on other actors in the network.

entirely faithful to Rayward's definition of a conjuncture being "slow enough not generally to be perceptible to those who live through them" (Rayward 1996, 12). However, our use of the term is motivated by the fact that organizational changes are often situated in the daily activities of organizational actors (Orlikowski 1996) that may not be perceptible at a micro-level, and can be understood only when the actions are studied with reference to both the historical and the current context under which the activities take place.

In our study, we extend the notion of conjuncture to not merely depict a critical sequence of events, but also to establish the historical factors that constitute a conjuncture. The sequence of historical events collected as part of the study is classified into conjunctures that are delineated by either a change in the technology or its usage, combined with changes to the external structure of position-practices of the agents. The quadripartite model of structuration, as outlined in Fig. 3, is then applied to each of the conjunctures to analyze the technology assimilation process by the organization. This is done by analyzing the external environment, socio-technical network and the outcomes of each of the conjuncture and its impact on the subsequent conjuncture.

The first step followed in the quadripartite analysis involves analyzing the external terrain in which the organization operates during each of the conjunctures. This is done by capturing the political, economic, technological and institutional context that forms the external conditions of actions impacting each of the conjunctures. We then lay out the socio-technical network comprising of key agents and technologies. For each of the human agents, we determine their position-practices and track the changes to these position-practices over the conjunctures. For each of the key technologies, we analyze its material properties and the socio-cultural structures inscribed in them.

We then analyze the interactions between the human and the technology agents. For the human agents, we evaluate the conjuncturally specific knowledge held by each of the position-practices including their understanding of the external structures, other agents' world views, technology's material properties, its inscribed structures, and the functionality relevant to the situation. For the technological agents, we

The modified structures arising as a result of the outcome of each of these conjunctures is then used as an input to subsequent conjunctures. Our attempt is to conduct a recursive analysis comprising of micro-meso level actions in each of the conjunctures and then integrate the analysis across conjunctures to understand the relationships being played out at meso-macro level over a longer timescale.

4 Organization's tryst with technology

In this section, we present a brief description of the organization and its process of technology assimilation.

4.1 Organization and its strategic terrain

The organization (pseudonym Alpha) is a leading multi-format retailer in India. Alpha started as a textile manufacturing company and entered the garment retail business circa.1995. This era corresponds to the post-liberalization phase of the Indian economy when modern retail in India was still in its infancy (Sengupta 2008), but considered as the next sunrise industry offering immense potential to business houses (Srivastava 2008). The organization that we focus on in our case study is the independent business entity that Alpha set up in 2001 to focus on the multi-format retail business segment.

Internationally, retail is considered as a mature industry with established business practices and advanced information systems that are aligned to these practices. Indian firms entering the modern retail business partnered with international retailers as technology partners with the objective of bringing

these international business practices and technologies to India. However, adopting these practices and technologies were found to be challenging owing to country-specific issues such as: a dearth of qualified retail personnel, an inefficient supply-chain, a weak IT eco-system, and the difficulty in understanding the idiosyncrasies of the Indian consumer and her buying-behavior (Dash and Chandy 2009). In addition, the regulatory requirements in India imposed additional constraints that needed to be built into the business processes and corresponding IT systems. One such example is the functionality required to handle Maximum Retail Price (MRP) which legally prohibits retailers from charging customers above the MRP – a functionality not addressed by most international retail software systems. Another example is handling of taxation in India with the "General Sales Tax" structure being transitioned to a "Value Added Tax" in a phased manner and implemented gradually across different states of India. To address these challenges, many retailers in India chose to develop their own IT systems. Alpha too chose to follow the path of developing an in-house system and not implement any standard retail package. During this period, India also had a burgeoning IT services industry and retailers were confident about the availability of qualified IT personnel and their ability to develop in-house IT systems.

India is known to be a nation of shopkeepers with a proliferation of unorganized retailers (Kachru 2011). The need to supply goods to this vast number of unorganized retail outlets resulted in companies developing a distributer network that was capable of reaching this scattered set of small retailers. The supply-chain ecosystem that evolved in India is tuned to delivering goods to such a vastly distributed network (Dholakia et al. 2012) with manufacturers led by the FMCG (Fast Moving Consumer Goods) sector having established last-mile logistics capabilities that could reach every nook and corner of the country (Sengupta 2008). The manufacturers, in turn, factored in these last mile distribution costs into their pricing and the retailers were willing to forego some of their margins to enjoy the benefit of direct store delivery. Unlike the unorganized retailers, the multi-store retailers invested in setting-up their own centralized warehouses and distribution channels in order to gain supply-chain efficiencies. The multi-store retailers expected a greater share of the margins in return for not using the manufacturers' logistics systems. However, the manufacturers who had already invested in developing the distributor network were unwilling to extend additional margins to these retailers. With no incentive to set-up their own supply chain network, many of the retailers initially relied on the direct-store-delivery facilities provided by FMCG manufacturers.

4.2 Technology adoption at alpha

In this section, we provide a brief narrative of Alpha's adoption of Information Technology over the last decade and half.

The report presented here is constructed based on the authors' interviews with Alpha employees, from data collected from the company websites (not referenced here to protect anonymity of the organization) and from books/reports available in the public domain. Alpha chose to develop its own IT systems and implemented a product called Retail Enterprise Management (REM) during the years 2001–2002. REM functioned both as an enterprise system as well as the store front-end and point-of-sale (POS) system. Alpha used REM as the sole IS for more than half a decade before adopting SAP as their enterprise system. The roll-out of SAP was undertaken during 2006-2009 with REM continuing as the POS system. The REM system was finally retired and the POS function migrated to a Wincor TP-Linux system in 2010–2011. The summary of the critical events during the technology adoption process and the corresponding organizational and technological changes is provided in Fig. 4. We adopt a process of identifying key events over a temporal duration and then use this to analyze the data; a process similar to past studies using temporal bracketing (Wahid and Sein 2013).

4.2.1 Agents-in-focus

We first provide a brief description of the key human and non-human actors involved in the adoption process.

Founder directors Alpha was set-up as a family run business with the founder-directors acting as the highest decision making authority at Alpha and the key influencers in defining the technology strategy. A core belief at Alpha was that of "Indianness" and Entrepreneurship.[2] Some of the principles, arising from these set of beliefs, that guided the organization include: a) develop IT systems in-house with the belief that Indians can produce world-class systems; b) retail in India is significantly different with its own idiosyncrasies and hence needs home-grown IT systems; c) the store manager should function as an entrepreneur and be empowered to make business decisions.

Business leaders This cluster of actors includes the department heads and senior management of Alpha. They were responsible for providing the functional road map for the information systems. These actors came from diverse business sectors and were limited in their knowledge of internationally established retail practices. Most business heads undertook field trips to international retailers in order to gain insights into organized retail. However, the exposure gained from these visits was usually limited to store operations as observed by a business unit head:

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[2] Stated values of the company as reported in the company website.
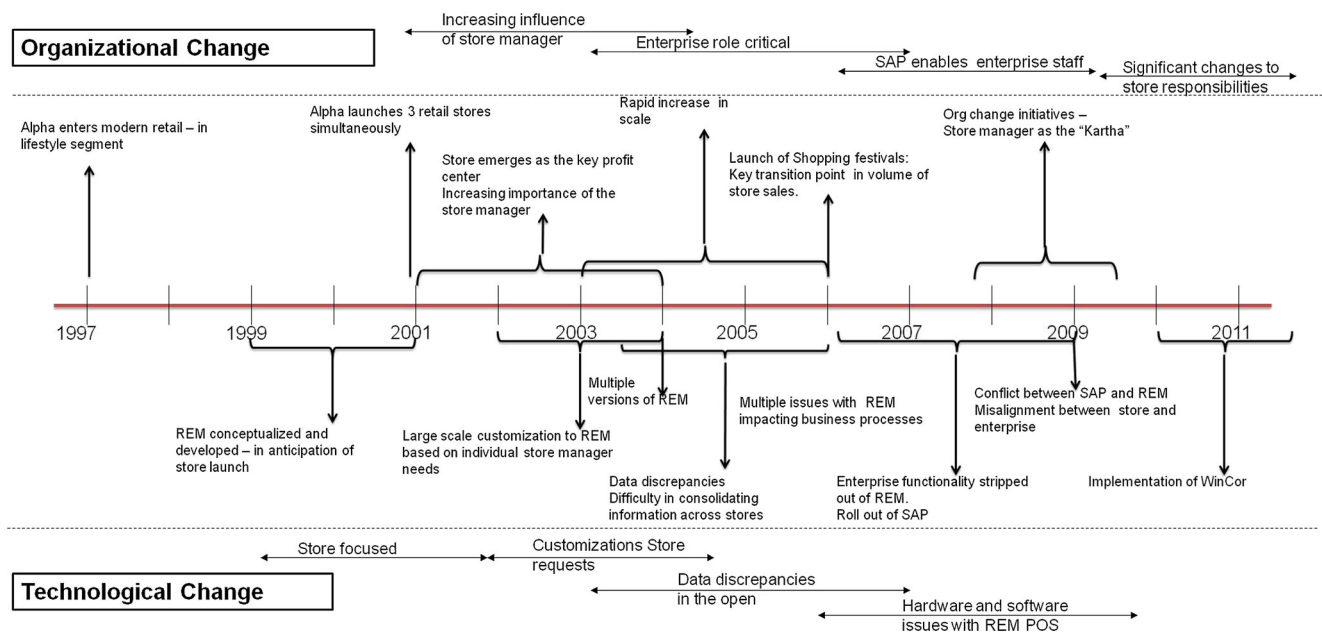
Fig. 4 Critical events and corresponding organizational and technological changes

"Retail business is like an iceberg, what one can see – the tip of the iceberg - is only the store functions. Consequently many of us who visited international retail chains could only view how the store functioned and all [functions] that goes into putting the merchandise in the shelf was not apparent to us."

The knowledge they acquired on the enterprise (non-store) functionalities were usually gained through their experiences in running the business operations and relied heavily on sales promotions.

IT leaders This set of actors includes the CIO and IT department heads. They owned the primary responsibility for IT strategy and introducing new technologies to the organization. The IT leaders too had limited exposure to international retail practices and believed that the IT systems will evolve along with the business operations.

Store manager This set of actors is our primary agent-in-focus and a key user of the IT systems. The store manager was responsible for running the retail store. The general disposition of the unorganized retail store owner can be viewed as having a trading mindset: maximizing short term benefits and an entrepreneurial attitude:

"The entrepreneurial instinct – even when one is an employee in the company – is very strong in this organization [….] Failure was seen as a stepping stone to success."[3]

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[3] Source: Secondary data, extract from a book on retail in India. Not cited here, as it would reveal the name of the firm.

IT Development and operations team This team was responsible for IT systems operation. The personnel staffed in these teams belonged to the emerging pool of young IT professionals aspiring to work for large IT organizations. They usually viewed their career in retail firms as a platform for training themselves.

Enterprise staff This set of actors comprised of the non-store operations staff such as Buying and Merchandising (B&M), Finance and Accounts (F&A), Warehousing, Marketing etc. They formed a part of the retail enterprise functions and reported to the respective business leaders. The key sets of technology actors central to our narrative include:

The retail enterprise manager (REM) system This is the technology that supported Alpha's business operation during its inception and was replaced by SAP and the Wincor system over time. The functionality built-in to REM included store operations as well as enterprise functions such as master-data-management (MDM), purchasing, receipts and inventory management. The system was built in-house and was designed to be highly customizable, allowing for frequent store level customizations and data-fixes. As observed by one of the informants:

"We developed REM during 1999–2000 using PROG-RESS software. The system was originally designed as a store system – one implementation per store, with functionalities for inventory management and store front-end transactions. However, it finally emerged into an ERP. Each REM instance maintained its own version of master data and we had a centralized BI system to pool in

data from each of the REM instances. Over a period of time, we did several individual customizations and by 2004, we had several different versions of REM!"

SAP The SAP IS-Retail system was known to be a best-in-class retail enterprise system. Though the system was highly configurable by design, the system did not lend itself to frequent changes. The SAP system did not have any in-built Point-of-sale (POS) functionality and had to rely on a third party software product for store operations.

Wincor The Wincor system was a new generation POS software with implementations across top retailers worldwide. Like SAP, Wincor was also not amenable to frequent changes post implementation.

4.2.2 The making of rem and its initial adoption

Indian consumers' demands are often thought to be complex, comprising of many unique parts based on cultural and linguistic identities (Bijapurkar 2009). While Alpha's background as a textile manufacturer provided them with a superior capability in apparel merchandising, they still faced acute shortage in managing non-apparel categories. During such a time, the store managers showed leadership in understanding consumer needs and recommending appropriate merchandise. This resulted in selective enterprise functionalities such as MDM and merchandise-receipt functions being built as store functionality. The initial version of the IT system emerged as an in-house developed system catering to store functionality with promotion management as a key feature. As the CIO of Alpha explained:

"The focus of development [during the initial days] was store functionality. Most retailers started with a few large stores. These stores would undertake all the retailing operations from sourcing to sale. Most of the back end functionality such as the merchandising, warehousing, distribution centre etc., were developed as add-on functions later on."

With the IS development focused on store functionality, the store manager soon emerged as the key user of the system. With Alpha's business model still evolving, the store manager was perceived as the key role on which Alpha sought to establish its foundation in the organized retail space as explained by the chief financial officer of Alpha:

"The store manager was considered as the entrepreneur running the business. He was empowered to decide what merchandise to keep, what promotions to run, the kind of discounts to offer, and take impromptu decisions on sales/promotions/merchandise etc."

An example of the store manager's entrepreneurial attribute is how Alpha used to drive store led promotions. Being a discount merchandiser, enticing consumers with attractive offers was a preferred way of selling. The store managers would assess consumers' shopping needs and respond with impromptu promotions by modifying the selling price through back-end updates to the database. A merchandising manager at Alpha recalled:

"The store manager used to scan the type of promotions the neighboring stores would offer and decide on the promotions that he would offer in a day. So, for example, if he noticed a large group of [a particular ethnic community] entering the store, he would quickly change the price of commodities typically bought by this consumer segment and then announce a spot promotion being offered for a limited time."

This functionality for promotion management soon got added to the REM as a front-end functionality to be executed by the store. In addition, the checkout personnel were often allowed the use of "manager's password", an open-access provision that allowed them to alter selling price to overcome any incorrect system updates.

Over time, the practice of adopting direct-store-delivery practices led to inventory discrepancies such as duplicate stock keeping units (SKUs), SKUs without bar-code, multiple MRPs, or 'SKU not found' (physical inventory not entered in system). The impact of such data discrepancies led to billing errors, long check-out lines, and products being billed at higher than MRP (a legal offense). To overcome these issues, store staff often used to resort to practices such as those of manual billing, price-overrides, and manual data correction.

Alpha soon became one of the leading discount retailers in India and had a rapid increase in store sales. The store manager emerged as the central agent in this growth. Each store started having an increased demand on the IT maintenance activities as the IT systems were primarily store focused and prone to data discrepancies. As a result, the store IT team size gradually increased and also led to a dual reporting structure with the store team reporting both to the IT function heads as well as to the store managers.

4.2.3 Rapid business growth and the need for enterprise systems

This phase corresponds to the time period 2003–2005 and was marked by key changes in the external conditions. First, ERP systems such as SAP and Retek were making inroads into India. Second, retailers were trying to establish centralized warehouses to achieve supply chain efficiencies and better margins (Srivastava 2008). Third, there was a growing expectation of a policy change that could allow foreign direct

investment (FDI) in retail (Mukherjee and Patel 2006). This created a sense of urgency among Indian retailers to achieve scale before the impending entry of foreign retailers. With the increase in the number of stores, centralized enterprise roles such as MDM, buying and merchandising (B&M), receipts and distribution, and marketing functions were gaining importance.

The distributed nature of the REM system warranted the creation of a business intelligence (BI) function for data consolidation across stores. The entry of the BI system highlighted the problems relating to the master-data and inventory discrepancies residing in the existing system. Consolidating data across stores became a challenge due to duplicate and inconsistent SKU codes at the stores. Further, REM lacked an archival functionality that resulted in performance issues due to increasing database size. Measures taken to address these performance issues, such as adding memory/processing power and suspending back-end functions during peak business hours, often had a cascading effect leading to further delays in inventory receipts. Data discrepancies, performance issues and inefficiencies arising out of these escalated the need for implementing an enterprise-wide system.

The executive management team took proactive steps to strengthen IT leadership by inducting new actors. The new IT leaders advocated the need for replacing the enterprise functionality of REM by ERP systems. The existing POS functionality of REM was however found to be suitable for business operations. This change was positioned as an essential step towards freeing store managers' bandwidth and enabling them to focus on store sales.

4.2.4 REM as a POS system

This phase corresponds to the time duration 2005–2009 with the roll-out of SAP across stores. During this time, organized retail was establishing itself as a mature industry with retailers adopting international practices such as: category management, store space management, centralized warehousing and distribution. POS technology also advanced during this time with integrated cash-registers, bill printers, barcode scanners, and weighing machines.

The SAP system brought with it internationally accepted practices. The enterprise staff, so far constrained by the limited functionality offered by REM, adopted SAP willingly. With the aid of SAP, Alpha was able to streamline the enterprise functions including B&M, warehousing and financial controls. A significant achievement was the control it obtained on its master data by centralizing product code creation and eliminating duplicate SKUs. Several functionalities in the SAP system were in contradiction to the way they were implemented in REM. An example to illustrate this point is that of promotion management. The mature industry practice for promotion management (as inscribed in SAP) is a centralized function to be administered by the B&M team. However,

sales promotion at Alpha had historically been a store manager's responsibility. A workaround to address this conflict was to have the B&M staff create header-level promotions (broad guidelines on the type of sales promotion per category/brand) and the store managers retain the responsibility of executing these promotions (i.e. decision on specific SKUs to be included under the header). Since the final control remained with the store managers, the header level promotion guidelines were often not followed faithfully and the stores resorted to floating their own promotions:

> "Promotion management continued to be a key area of concern. While the promotion header was decided by the merchandisers in the SAP system, the actual mapping of the SKUs and the implementation of the promotion continued to be a store activity. Example of a header level promo could be a 25 % off on a select set of SKUs – with a guideline provided to stores on specific SKUs to be added as promotion line items attached to the header. The actual mapping of the SKUs to the promotion header was a store activity and store managers continued to use their discretionary powers to create their own promotions. So, the store manager, for example, applied the header level promotion guideline on a SKU that is not intended to be on discount."

This led to three significant consequences: a) Alpha noticed considerable leakage in the revenue margins due to unauthorized promotions; b) led to instances of pilferage due to the open-access control of REM, and c) non-standardization of promotions across stores led to discontent among its customers.

In addition to these functional issues, Alpha also faced certain technical challenges with the REM system. The POS terminals deployed at Alpha were essentially a combination of a desktop computer connected with peripherals (barcode scanner and printer) running on Windows operating system. The rapid scale-up in the number of stores meant that Alpha had to not only invest in the desktops and peripherals, but also had to buy licenses for Windows and Progress database (required for installing REM). The escalating costs resulted in a need to adopt newer POS technology that can offer both an integrated system and better cost efficiency.

With the implementation of SAP, Alpha reinforced its IT leadership team with key personnel experienced in managing international retail-IT products. The new leadership convinced the directors and business heads to retire REM and adopt an international POS product. This phase ends with a decision to replace REM by the Wincor POS.

4.2.5 Wincor and organizational change

The new IT heads, drawing from their past experience in implementing Wincor on a SAP system, provided the

necessary expertise in driving this program. A phased implementation approach was adopted. In contrast to the SAP implementation, the roll-out of POS solution was expected to have a much greater impact on the life at the store, and the store staff were not convinced that the POS system needed a change, as observed by one of the IT managers:

> "The store staff were not really exposed to efficient POS operation procedures. The benchmark [which they compared the POS system to] was against manual billing. The hardware used was often outdated. As a result, the increased checkout time required at cash till was often seen as a constraint imposed by the growth in business and not really as a problem introduced by the software. The solution often sought was to increase the memory and CPU capacity of the hardware."

The store cashiers and the check-out staff were the direct user of the Wincor system and hence likely to exhibit resistance in adopting the new technology. But, the impact of the Wincor system on these actors was expected to be minimal with net positive benefits, given the lesser steps to billing, speedier checkout, faster response time, graphic touch-screen and other "friendly" features. However, it was anticipated that the store managers would resist the new system as it did not incorporate several functionalities that were by now integral to the entrepreneurial empowerment of the store manager – such as the ability to execute spot promotions.

Recognizing these challenges, Alpha decided to launch an organizational-change initiative as part of the introduction of the new POS system. The concept of a "Store Kartha" or the "head of the family" was introduced. The introduction of the new POS system was also launched as a cultural activity: a new beginning with new philosophy, new machines, new software, and launched with a "pooja" (worship for prosperity). As part of the cultural activity, the store was decked up, the Wincor terminals made the center of attraction, and the store cashiers positioned as proud users of new generation technology.

The issue of managing promotions in the new system was critical to success. The first challenge was the resistance expected by the store manager's inability to administer promotions: a key lever used by the store manager to increase sales. This was addressed by positioning the change in responsibility as merely transferring a routine job (of creating promotion codes) from the store to the back-office. The management realized that the issue of the store exercising their own promotions (once considered as a key strength) was due to the ad hoc manner by which the promotions were executed where these resulted in margin impacts. Shifting the activity to the back-office would lead to the dual advantage of making promotion management a centralized activity but still retain the ability to incorporate feedback from stores. The need to

plan promotions in advance was portrayed as a valid and reasonable constraint imposed by the system.

Pilot implementation of Wincor faced a series of challenges including store resistance and data transfer issues between SAP and Wincor. However, these were perceived as implementation hurdles and ultimately addressed. In the subsequent months, Wincor was rolled-out in a phased manner across all the departments of Alpha.

5 Analysis using strong structuration and actor networks

We now interpret the data from the case using concepts from SST and ANT to demonstrate the processes of macro-level structuration as the organization assimilated technologies.

5.1 Network of position-practices

A key aspect of Stones' theory is to draw the network of position-practices and envisage agents to be in the midst of these position-practices. The agent-in-focus understanding of the external conditions of actions is dependent on the conjuncturally specific knowledge of the networked others (Coad and Herbert 2009). Drawing such a network of position-practices thus enables the researcher to understand the position of the situated actor within the network and the conjuncturally specific knowledge of others that forms the conditions of action for the agent-in-focus. Table 1 provides a summary of the key IS functions in use at Alpha. The columns C1 to C4 correspond to the conjunctures 1 to 4 and indicate the IS systems that administered these modules.

The internal structures for each of the agents are summarized based on their general disposition and their embodied knowledge based on historical and social forces derived from the external conditions. Figure 5 provides a summary of the internal structures for each of the agents. In the following sections, we attempt to explain the technology assimilation process at Alpha through a quadripartite analysis of each of the conjunctures and illustrate how the network of position-practices change over time and in-turn influence the agents' internal and external structures.

5.2 Conjuncture-1

The broad strategic terrain under which Alpha initiated its technology adoption was during the infancy of organized retail in India with established supply-chain networks catering predominantly to the unorganized markets (Mukherjee and Patel 2006). While India was emerging as a global IT provider, the organized retail industry in India was not yet ready to accept international retail software. Analyzing in terms of SST's framework, the external conditions can be viewed as

Table 1 Summary of IS functions

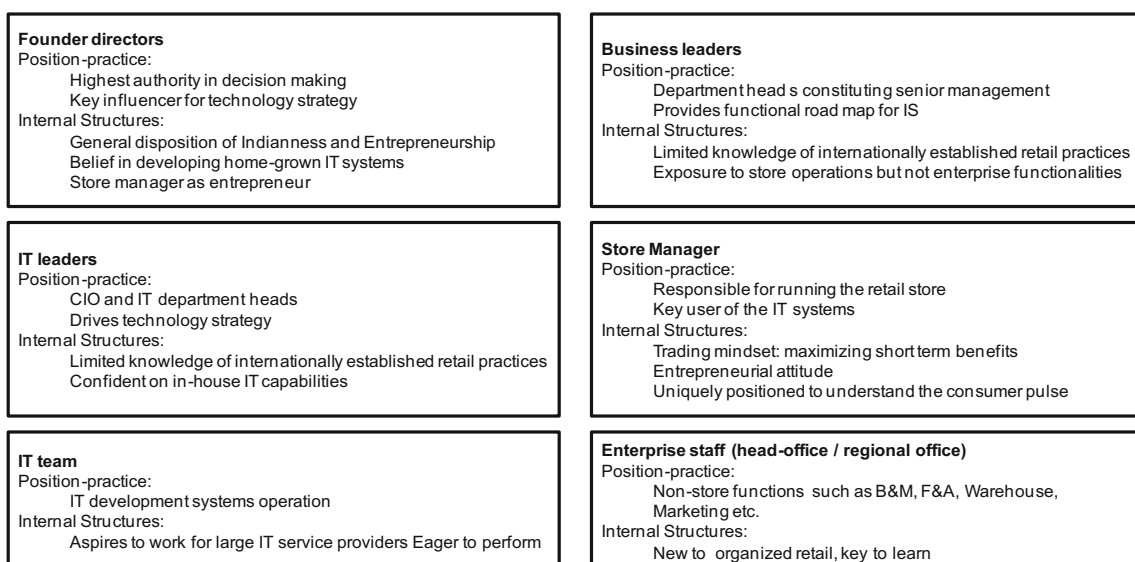| Module	Functionality	Key user	C1	C2	C3	C4
POS	Includes all point-of-sale functions including store sales, return processing, and sales promotions.	Store check-out staff	REM	REM	REM	Win-cor
MDM	The master-data-management is used for creating and maintaining products	B&M	REM	REM	SAP	SAP
Inventory	Product-wise inventory data at the store and warehouse	B&M (replenishment) Store (monitor sales)	REM	REM	SAP	SAP
Purchase	Purchase orders based on forecasting needs; consolidating the indents of all stores	B&M (central purchases) Store (direct-delivery)	REM	REM	SAP	SAP
Margin control	Monitor gross margins by product/category. Negotiate with vendors.	B&M	Offline Report	REM	SAP	SAP
Logistics	Goods receipt, quality check, stacking, and service to stores	Warehouse	REM	REM	SAP	SAP
FICO	Finance and Control functions including accounts receivable and payables	Finance	Offline Report	Tally	SAP	SAP
BI	Business Intelligence – consolidation of data across stores to conduct region/category analysis	B&M Business leaders	Offline Report	Add-on IS	SAP	SAP

an organizational environment that has no established industry practices, a supply chain that is dominated by FMCG manufacturers, and a general lack of understanding of the needs of the Indian consumer.

At a micro-level, we observe the senior management's understanding of the strategic terrain - such as the buying behavior of the Indian consumers (as a bargain hunter), the constraints imposed by the supply chain network (direct-store-delivery by FMCG manufacturers), the regulatory requirements (MRP functionality, sales-tax structure) etc. - led them to believe that international retail IT systems were not suitable for Indian conditions. This conjuncturally specific knowledge, aided by their disposition of Indianness, influenced the decision to develop in-house IT systems.

With the initial focus of Alpha's business centered on store operations, the store manager became the central agent-in-focus around whom the business operations as well as the IS development unfolded. The general disposition of the store manager was that of a trader whose primary responsibility was to sell the merchandise on hand. Customer relationship was not considered a primary responsibility of the store manager, and repeat customers were sought by appealing to the bargain hunting attribute of the consumers and not necessarily by superior customer service or store ambience. With a lack of established business practices and IT systems, the store manager was allowed a free hand in running the store. The conjuncturally specific knowledge of the store manager can be viewed as the need to run the business as an entrepreneur with the sole objective of maximizing daily sales.

We notice the impact of these micro-level actions resulting in REM evolving as a distributed system that not only catered to store functionality but also incorporated some enterprise

Founder directors
Position-practice:
    Highest authority in decision making
    Key influencer for technology strategy
Internal Structures:
    General disposition of Indianness and Entrepreneurship
    Belief in developing home-grown IT systems
    Store manager as entrepreneur

IT leaders
Position-practice:
    CIO and IT department heads
    Drives technology strategy
Internal Structures:
    Limited knowledge of internationally established retail practices
    Confident on in-house IT capabilities

IT team
Position-practice:
    IT development systems operation
Internal Structures:
    Aspires to work for large IT service providers Eager to perform

Business leaders
Position-practice:
    Department head s constituting senior management
    Provides functional road map for IS
Internal Structures:
    Limited knowledge of internationally established retail practices
    Exposure to store operations but not enterprise functionalities

Store Manager
Position-practice:
    Responsible for running the retail store
    Key user of the IT systems
Internal Structures:
    Trading mindset: maximizing short term benefits
    Entrepreneurial attitude
    Uniquely positioned to understand the consumer pulse

Enterprise staff (head-office / regional office)
Position-practice:
    Non-store functions such as B&M, F&A, Warehouse, Marketing etc.
Internal Structures:
    New to organized retail, key to learn

Fig. 5 Internal structures of position-practices

functionality. With the organization discovering new ways of working with each passing day, the REM system was challenged to keep pace with the evolving context. Workaround functions (such as manual overrides, back-end updates etc.) emerged for cases where the technology and agency were not aligned. These practices, such as promotions, manual overrides, and back-end updates, soon got inscribed into the IT systems.

The outcome of the agency described above can be summarized as a strengthening position-practice of the store manager. Practices adopted by the store manager translated into functionalities such as store specific master data, ad-hoc promotions, manual overrides, and back-end updates that got inscribed in the REM system. These inscriptions soon assumed a taken-for-granted status and became a way of functioning for the organization. By the end of this conjuncture, REM was established as the primary IT system for administering Alpha's retail operations and was firmly entrenched in the actor network of position-practices and technologies that represented Alpha's business operations. This actor network gained stability and led to a rapid increase in store business. The network of position-practices, their interactions with technology and the resulting actions is depicted in Fig. 6.

5.3 Conjuncture-2

This conjuncture corresponds to the rapid growth in the number of stores at Alpha. The opening up of the economy, the impending policy change, and the entry of ERP majors such as SAP and Retek can be seen as the significant changes in the strategic terrain during conjuncture-2. Alpha faced threats from new entrants given the high growth potential of the industry, the low entry-barriers for Indian operators and the possibility of opening up of FDI. The strategy adopted by Alpha was to rapidly increase scale to counter this threat.

These actions significantly altered the position-practices at Alpha. First, Alpha strengthened the enterprise roles such as buying and merchandising (B&M), distribution centers, and other central and regional roles. These centralized functions required the consolidation of data across stores leading to the inclusion of a BI system. The BI system exposed the store level issues pertaining to master-data management, related inventory discrepancies and potential losses in sales margin.

A second set of changes is observed in the network of position-practices relating to IT. By now the store manager, and by association the regional operation managers, had a growing influence on the IT team. With the increasing support required by the stores, the size of the IT operations teams was also increasing regularly with most of the effort being spent on non-strategic IT activities. The actions taken by the IT leadership were driven by: a) the growing issues with respect to the accuracy of information, b) the increasing costs of the IT operations team, c) the increasing IT related performance issues at the store and d) the inroads made by ERP majors. The decision to adopt SAP can be seen as the outcome of the actions driven by this conjuncturally specific knowledge.

We notice that the altered position-practice of the enterprise personnel (who are spatially distanced from the store manager) did not impact the position-practice of the store manager significantly. Being responsible for the front-end sales, the store manager welcomed the removal of non-value adding activities from his roles (such as overseeing the receipt of stocks). The main lever with which the store manager operated continued to be promotions/discounts that he could control. The store manager did not see himself being impacted adversely by the introduction of SAP as the sales promotion activity was still designed to be a POS functionality in REM.

Thus we notice that conjuncture-2 resulted in the introduction of a new technology actant into the actor network and
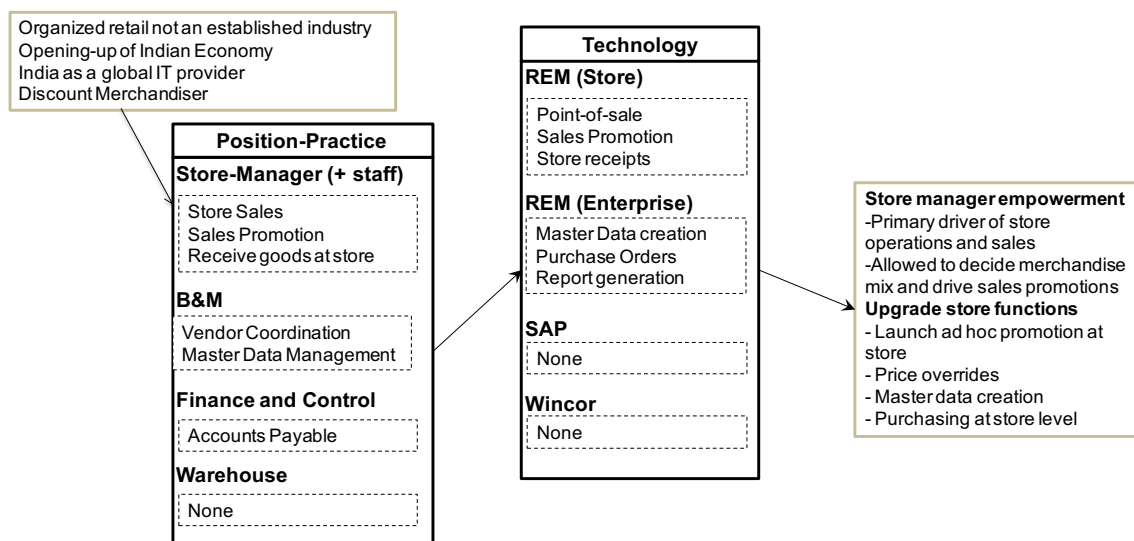

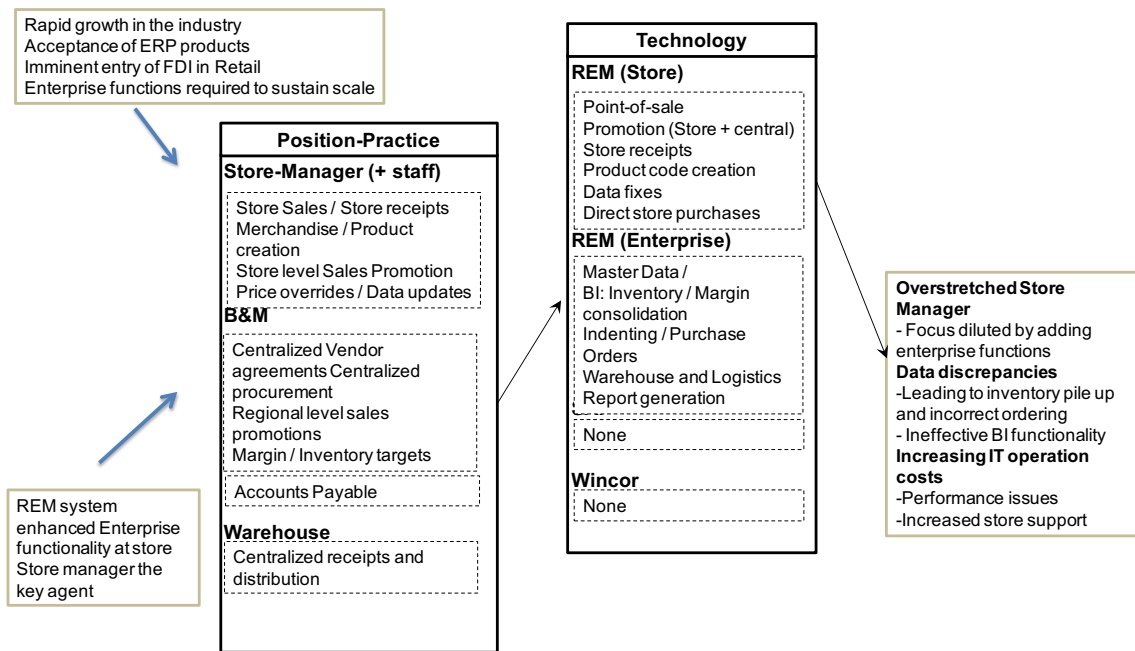**Fig. 6** Conjuncture-1: Position-practices and Technology actants

Fig. 7 Conjuncture-2: Position-practices and Technology actants

altered the position-practices of the enterprise staff and the store managers. We also notice that the POS system built into REM, with its sets of allies and inscriptions, continued to be reasonably frozen. Figure 7 depicts the network of position-practice and the technology actants for conjuncture-2.

5.4 Conjuncture-3

This conjuncture unfolded over a period of four years and saw some incremental changes in the strategic terrain marked by the maturing of established retail practices in India and the entry of new generation POS systems. During this conjuncture, we notice the polarization of the actor network into two parts: one centered on SAP and the enterprise actors; and the other centered around REM and the store actors. With the aid of SAP, Alpha was able to adopt standard industry practices and implement robust enterprise functions. Enterprise functions such as B&M gained importance as they were able to achieve efficiency in inventory management and increase gross margins. The stores on the other hand maintained their network of position-practices with the store manager continuing to run the stores with an entrepreneurial attitude. Further, the store managers were able to improve the store sales aided by improved inventory management capabilities and marketing support provided by the enterprise staff.

In effect, the position-practices of both the enterprise staff and the store managers seemed to have strengthened and complimented each other. However, a problem that surfaced and eventually led to the breakdown of the actor network was the conflicting inscriptions between the two primary technology actants in the network. The industry standard promotion

functionality inscribed in SAP conflicted with the "trading" approach to promotions adopted by the store managers. As a result, header-level promotions set-up by the B&M team was not faithfully executed by the store team. The failure of this integration layer between REM and SAP combined with the escalating licensing costs led to a further breakdown of the actor network around these technology actants.

With the SAP system in place, the IT leadership team was strengthened with additional global actors who carried significantly different dispositions and knowledge. The agency initiated by these global players, drawn from their modified understanding of the strategic terrain and the revised set of position-practices, led to an active problematizing of the POS functionality in REM . Enterprise staff and business leaders were then enrolled into this process, leading to the decision to replace the REM systems with a new generation POS systems. The network of position-practices for conjuncture-3 is depicted in Fig. 8.

5.5 Conjuncture-4

This conjuncture witnessed a series of micro-level actions leading to irreversible changes to the IT landscape at Alpha. The Wincor system included internationally established practices, several of which were opposite to those of REM. While the Wincor system was seen to be aligned with the SAP network and its allied actors, it potentially faced resistance from the store managers who viewed it as denting their entrepreneurial spirit.

Ensuring the stability of the new actor network required the alignment of the store managers with the Wincor system. The acceptance of the Wincor system by the store managers required a significant change to their internal structures (dominant
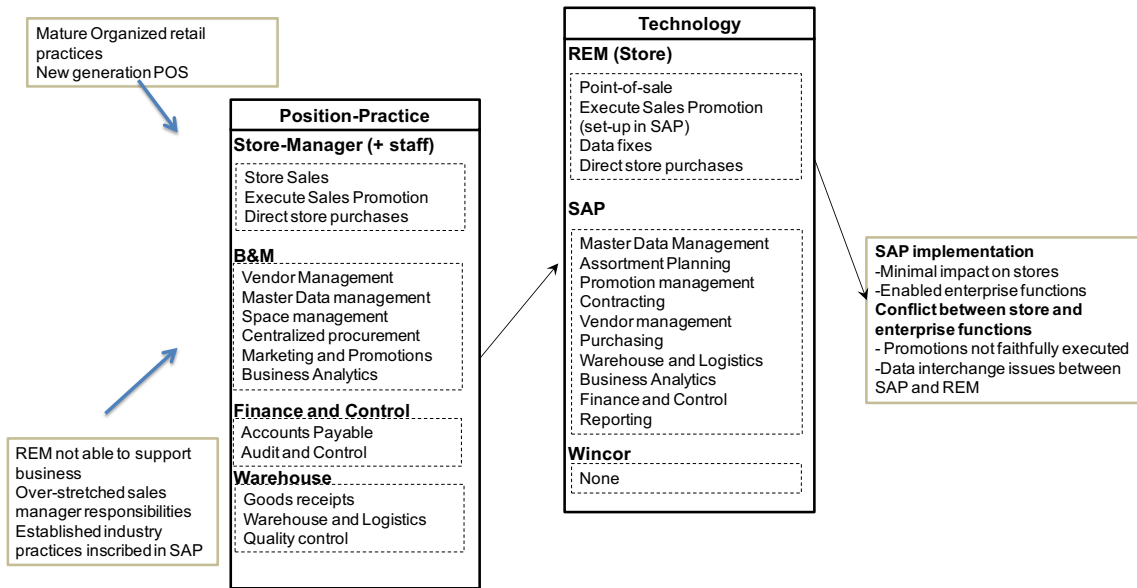
Fig. 8 Conjuncture-3: Position-practices and Technology actants

position-practice and entrepreneurial disposition). This was achieved by launching an organizational change initiative. The process of introducing the Wincor network was achieved by virtually re-launching the store, introducing the "Store Kartha" philosophy (store manager as the head of the family) and performing a "Pooja" (a religious ceremony) as a ritual performed to mark the reincarnation of the store. These incidents can be seen as an active agency to alter the general disposition of the store staff.

The store staff, including the customer service representatives and the check-out cashiers, were roped in as allies through training programs aimed at demonstrating the cool features of the new POS systems, and positioned as the actors

responsible for maximizing the advantages derived from the new POS. Any resistance from the store manager was overcome by repositioning his role and freeing his bandwidth from operational issues.

The outcome of this conjuncture can be seen as the restoration of a stable actor network leading to an altered position-practice of both the enterprise and the store staff. The conjuncture was marked by agency carried out by various actors ranging from the role of the leadership team in altering the disposition of the store staff, re-launching of the stores, role of global actors in introducing new technology, and the process of aligning the technology's function-in-use to those of the actors needs. Figure 9 summarizes the position-practices and
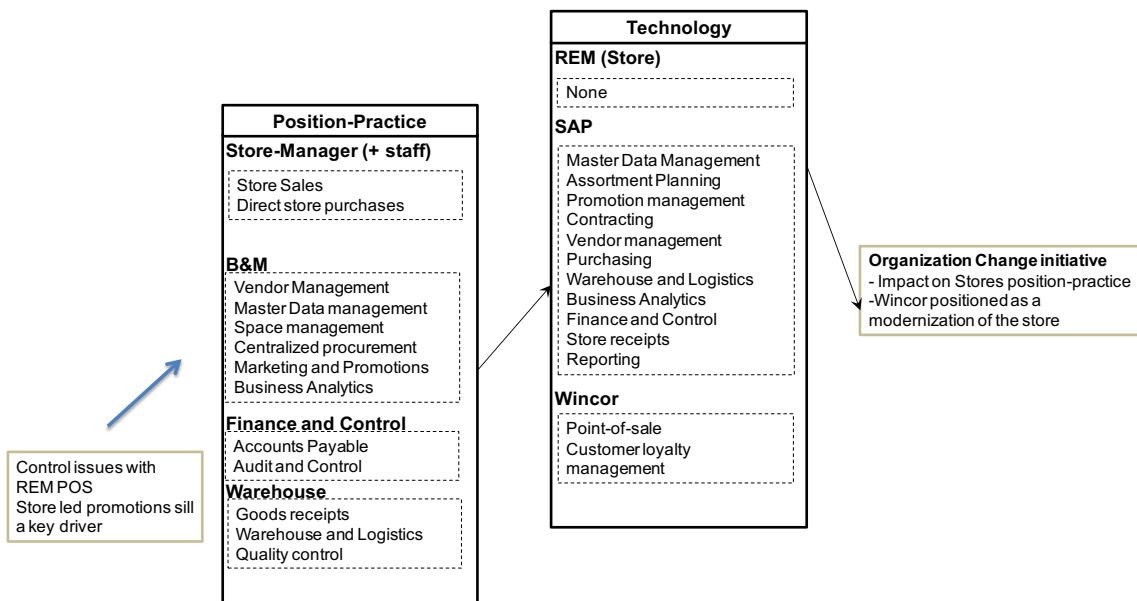

Fig. 9 Conjuncture-4: Position-practices and Technology actants

the technology use in conjuncture-4. A summary of the quadripartite elements engaged in each of the conjunctures is provided in Table 2.

6 Discussion

Researchers have highlighted the need for developing richer models of intra-organizational processes, incorporating the interplay between technology and organizational features, for studying later stages of technology assimilation (Fichman 2000). In this paper, we set out to illustrate the complexity involved in the technology assimilation process by studying an organization over a long period of time. We illustrate how the process of assimilating technology leads to organizational changes – both intentional as well as emergent; and the subsequent impact this has on the choice of technology. The context for our study is that of an organization that is establishing itself in the emerging retail industry in India. The choice of retail industry provides us the context of an industry that has internationally established practices and mature technologies, but is still evolving in the Indian context. We notice that the adoption of technology by the organization is not just the implementation of mature technologies, but instead is a process through which the organization "discovers" these technologies and adapts to it. Our study elaborates the interplay of heterogeneous actors, organizational context and evolving technologies during the adoption process.

Table 2 Quadripartite elements of SST

Quadripartitie Elements	Conjuncture-1	Conjuncture-2
External structure	- Organized retail not an established industry - India as a global IT provider	- Entry of international ERP products - Imminent entry of FDI in retail
General disposition & embodied knowledge	- Indianness and entrepreneurship - Lack of multi-format retail expertise	- Indianness and entrepreneurship - Need to scale up rapidly, importance of process
Conjuncturally specific knowledge	- Discount merchandiser - Focus on store related functionality, develop enterprise functionality later	- Need to establish strong enterprise systems - Buying & merchandising, centralized warehouse
Material property and Social inscriptions	- Malleable software - Empower store manager	- Runtime promotions a key driver for sales. - Open access and data fixes are essential tool
Conjuncturally specific functionality	- Manual billing/Promotions management/ - Enterprise functions at store	- Need for BI functionality - Conflict between front-end and backend - Scalability and performance issues
Active agency	- Store managers run stores as independent enterprise - Ad-hoc functionalities added to REM	- Problematization of the REM functionality and advocacy of SAP to support future growth - Need to release the bandwidth of sales manager
Outcome	- Rapid growth in store sales: improved position-practice of the store manager - Enterprise function as a support system - Signs of data discrepancies	- Decision to implement SAP - Strengthening of several enterprise roles - REM retained as the POS system

Quadripartitie Elements	Conjuncture-3	Conjuncture-4
External structure	- Maturing of organized retail practices - Entry of new generation POS	- Mature retail industry
General disposition & embodied knowledge	- Entry of global actors to IT leadership team	- No change
Conjuncturally specific knowledge	- Organizational scaling needs enterprise management skills	- Global IT leaders with modern retail experience - Successful SAP implementation leading to trust in international products
Material property and social inscriptions	- Retail best practices incorporated in SAP - Conflict between SAP & REM inscriptions	- Opposing inscriptions - REM and Wincor - Wincor not as malleable
Conjuncturally specific functionality	- Promotions executed unfaithfully at the stores - Manual billing leading to inventory issues - Incorrect promotions leading to loss of margins	- Faster check-out processing time - Limited promotions functionality
Active agency	- Active advocacy to adopt Wincor	- Organizational change initiative - Reconfigure store manager's position-practice
Outcome	- Decision to implement Wincor	- Transition to new set of technologies and altered position-practices

A key role played by the top management in an organization is the introduction of appropriate technology based on changing organizational needs. Like past studies (Dong et al. 2009), we also notice that top management has a role in influencing the organization's staff in adopting technology. However, our study also points out the indirect influence that senior leadership needs to exert for effective assimilation, such as launching organizational change initiatives along with new technology introduction to ensure that none of the position-practices are adversely impacted by its introduction. An example seen in our study is the launching of the "store kartha' program and re-launching the stores as part of the introduction of Wincor POS systems at the store.

In addition to top management involvement, our study also demonstrates the important role played by organizational actors such as middle management and line staff in the assimilation of IS. Our study indicates that actions taken by key staff based on their position-practices, dispositions and knowledge may have a significant impact in shaping the assimilation process. We notice that the entrepreneurial mindset of the store manager and his need to maximize store sales through ad hoc promotions is what shaped the evolution of the REM system during the initial years. However, with the scaling up of the operations, we notice how the altering position-practices of the store manager and the merchandisers led to introduction of new technologies. We also note that fringe actors such as store cashiers had to be actively managed when the new technology was introduced. The preferences of end-consumers, who were not the direct users of technology, are also seen to be yielding influence on the technology choice – initially by their bargaining power that shaped REM, and later on by their demand for better services leading to the introduction of Wincor.

Another key insight provided by our study is the role of technology itself in shaping the assimilation process. REM was a home grown system that co-evolved with the organizational practices and was shaped by the needs of its primary user – the store manager. SAP and Wincor, on the other hand were imported technologies that were inscribed with industry best practices. The introduction of these technologies significantly altered the position-practices at Alpha and required proactive management of the resulting organizational changes. Our study also illustrates the mechanism by which an existing technology was retired and replaced by new technology. The replacement of the REM enterprise system by SAP was triggered by the need for introducing industry standard practices. The introduction of SAP was not perceived to be resisted by the organization's staff: as the key users of the enterprise systems were already feeling constrained by the limitations of REM. In contrast, the replacement of REM POS system was triggered by the misalignment of the REM system with SAP. The introduction of Wincor as a replacement of REM POS system was anticipated to be resisted by the store managers as this would impact their ability to control front-end promotions – perceived by them as a key lever for driving sales.

In our study, we have used the concept of conjunctures to analyze the historical and exogenous factors that impact the assimilation process. Our conjunctures are marked by factors like the organizations characteristics (such as size, scale and market positioning), the external environment (such as economic conditions and consumer demand), the position-practices of the organization's staff (including that of the top management, store managers and line staffs), and the changing technology landscape (technology evolution and the introduction of imported systems). In conjuncture 1, we notice the role played by historical factors – such as the booming IT industry in India that led to the belief that the world class IS systems can be built in house, or the background of the promoters that led to Alpha's organizational culture and market positioning that had a significant influence in shaping REM. In conjuncture 2, we notice that the reason for introducing SAP was not just the business needs driven by rapid scaling up, but also due to the exogenous factor of changing macro-economic conditions and the active lobbying for FDI in retail. In conjuncture 4, we notice that the introduction of Wincor as store POS was perceived to be a lot more difficult than the introduction of SAP itself. It may be noted that the SAP rollout was a technologically complex activity impacting several enterprise functions and required decoupling the enterprise and POS functionality, setting-up of new master data, and migration of large volumes of data from the REM to the SAP system. In comparison, introducing Wincor can be considered as a simpler task since the impact is localized to store POS systems. That the Wincor migration was actually considered as a more difficult activity when compared to SAP migration can be comprehended only when one considers the historical factors of the organization.

A primary contribution of our study is to illustrate the role of heterogeneous sets of organizational actors, the socio-technical network, and the contextual and historical factors in the technology assimilation process. A second contribution of our study is to illustrate the possibility of both situated and episodic change during the technology assimilation process. We notice that while organizational changes could be emergent, there is also a need for management to undertake planned change initiatives to ensure that organizational actors are ready to accept the new technology. Another contribution of our study is to demonstrate the applicability of macro-level structuration process in the study of technology adoption. Past IS researchers using structuration analysis have focused on micro-level phenomena such as the study of Case tools (Orlikowski 1992), Lotus Notes (Karsten 1995), and Decision Support systems (DeSanctis and Poole 1994); or to explain adaptations to IS development process such as the study of global virtual teams (Maznevski and Chudoba 2000) and adaptation to agile methodologies (Cao et al. 2009). In our

study, we have illustrated the structuration process at a macro-level. By adopting SST as the theoretical lens, we have illustrated how the structuration unfolding at a micro-meso level in each of the conjunctures is manifest at a meso-macro level over a longer timescale. Structuration theory is limited in its usefulness for conducting macro-level studies. Our study demonstrates the value of strong structuration theory and actor network theory for conducting macro-level studies involving information technology. We have extended the original work by Stones (2005) and Greenhalgh and Stones (2010), by drawing on additional ANT concepts to explain the agency actions arising out of technology change and the subsequent impact of actor networks on organizational structures.

7 Conclusions

Assimilation is defined as "how extensively the innovation is used and how deeply the firm's use of the technology alters processes, structures, and organizational culture" (Gallivan 2001, 59). We pointed out that technology assimilation studies have largely been variance studies focusing usually on the role of top-management support and firm characteristics such as its absorptive capacity. We have elaborated the need for a holistic analysis of the assimilation process that considers the role of various organizational actors, the socio-technical environment, the exogenous factors and the historical context under which the organization is assimilating technology. Such an in-depth study of the assimilation process warrants the need for conducting a longitudinal study over an extended period of time. We have further highlighted the complexities presented by such a macro-level study.

The topic of technology led organizational change is of significant interest to the IS field. Past IS researchers have used the concepts of planned change, situated change and punctuated equilibrium model to understand technology led organizational changes. We argued that the technology assimilation processes could, in fact be a combination of situated or episodic changes; emergent or planned changes; and is led by an alteration of structures, socio-technical elements and contextual factors.

We proposed the need for combining two widely used meta-theories used in IS research: structuration theory and actor network as the theoretical lens for our study. Viewing a macro-level technology led organizational change as a structuration process, however, requires us to analyze the structuration activity at a meso-macro level occurring over longer timescales. We highlighted the methodical issues in applying structuration theory for such macro-level analysis and proposed the use of Stones' strong structuration theory for conducting such a study. We further highlighted the need for integrating this theory with actor network theory to incorporate: a) the socio-technical element into the structuration process, and b) the evolution of technology itself during the process of structuration.

Following past assimilation studies on retail industry (Zhu et al. 2010), we chose the technology assimilation journey by an organization establishing itself in the emerging retail industry in India as the empirical context for our study. We studied the technology assimilation process and the subsequent impact on the organization as a series of conjunctures spanning over a decade. Quadripartite elements of SST are useful to analyze the ongoing change process as series of actions at a micro-meso level driven by various factors - including the external conditions of actions, the general dispositions of the agents, their embodied knowledge, and their understanding of the position-practices of other agents. An analysis of the outcome of these actions at a meso-macro level to determine the subsequent changes in the position-practices reveals the alterations in the general disposition of the agents.

As an implication for practice, our study points to the requirement for realigning technology with organizational needs as is evident from the evolving position-practices and the subsequent impact on the actor networks that toggle between stability and instability. It is evident that a successful technology, at a given moment of time, may outlive its utility in a future time. Our study suggests that one of the reasons why organizations have the need to replace old technology with new ones is due to the misalignment of the technology with other contextual factors. The process of realignment may need a multitude of activities such as incorporating new technologies (adding actants), reinforcing leadership (adding new actors), launching organizational change initiatives (altering the disposition of key actors), or realigning roles & responsibilities (altering position-practices).

As an implication for research, we highlight the role of historical factors in shaping the technology adoption of an organization (Land 2010). Past researchers have indeed studied the role of historical factors in determining macro-level outcomes impacting industries: such as the evolution of India's software industry as a result of the liberalization policies adopted by the government (Heeks 1996); or the impact of information technology on business profitability (Hitt and Brynjolfsson 1996). However, IS researchers have rarely examined the role of historical factors in determining the technology choices made by organizations. In this paper, we have illustrated that the technology assimilation process of an organization is not independent of its history. Studying the impact of historical factors in an organizations' adoption of technology requires us to analyze how these factors impact at the micro-level and then construct its outcome at the macro-level. We have also used the concepts of conjunctures, actors and actants to elaborate the richness of a macro-level technology assimilation study.

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