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Organizational assimilation of technology in a sunrise industry - A story of successes and failures

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Abstract. The study analyzes the contextual factors impacting technology assimilation in an environment that is characterized by macro-economic changes, rapid technological innovations, emerging industry practices and shifting organizational contexts. Stones' strong structuration theory (SST), a refinement of Giddens' structuration theory, is used as the theoretical lens for studying the technology assimilation process. SST is used to analyze the structuration process at the micro-level and its impact on the structures at the meso/macro-level. In addition, actor network theory (ANT) is used to analyze the role of heterogeneous actors in altering the structures as the actor network adapts to the technological innovations and changing contexts.

Keywords: Structuration theory, Actor network theory, Technology diffusion, Technology assimilation

1. Introduction

Studies of technology in organizations can be classified into two broad streams of research. The first stream adopts the ontological stance of discrete entities; the primary mechanism of diffusion being the moderation effect or technology impact; the methodology being variance-based studies; and the key concepts studied being technological imperatives or contingency models (Orlikowski & Scott, 2008). Most of the early diffusion studies fall into such a positivist stream of research and attempt to understand the relation between technology and organizational context, and its impact on the innovation diffusion process. The second stream of research adopts an ontological stance that assumes technology and organizations being part of a mutually dependent ensemble; the primary mechanism of diffusion being the interaction effect of technology with the organizational context and human actors; the methodology being process-based studies; and the key concepts being the duality of technology with technology viewed as both a physical and a social object (Orlikowski & Scott, 2008). A majority of the studies that fall into this stream of research focus on the interplay of technology and organization / human actors and the resultant impact on technology and organizational structures.

While technology impact in organizations has attracted research approaches from both of these paradigms, technology adoption and diffusion studies has largely remained positivist in nature. Fichman (Fichman, 2000) points out the limitations of the positivist stream of research in studying the later stages of technology assimilation involving formal adoption and full-scale deployment. In this paper, we attempt to contribute to the technology assimilation literature by conducting a processual study of such a phenomenon using a non-positivist paradigm. We conducted a single-case descriptive study (Yin, 2009) of an organization adopting technology while establishing itself in the emerging organized retail sector in India and as new technological innovations are introduced into this market.

2. Theoretical Background

We provide here a brief review of structuration theory and its application to the study of Information Systems (IS). We then outline the limitation of this theory for analyzing technology diffusion and propose a combination of Strong structuration theory (SST) with Actor Network theory (ANT) as the theoretical framework.

2.1. Structuration Theory and Diffusion studies

Giddens' theory of structuration (Giddens, 1984) has been extensively used in IS research as a meta-theory for studying the interaction of technology with organizations. Structuration is defined as "the knowledgeable actions of human agents [that] discursively and recursively form the set of rules, practices and routines which, over time and space constitutes [...] structure" (Rose, 1998). Giddens proposes that structure and agency are mutually constitutive and that social phenomena are a product of both. He also introduces the notion of duality of structures described through three components: structure (signification, domination, and legitimation), modality (interpretive schemes, facility, and norms) and interaction (communication, power, and sanctions). IS research that adopts structuration

theory can be seen to fall into two categories: Technology structuration (Orlikowski, 1992) and Adaptive Structuration (DeSanctis & Poole, 1994).

While structuration theory is an appropriate lens for studying later stages of assimilation (Fichman, 2000), it is also constrained by some of its limitations. First, structuration theory being a meta-theory 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). Secondly, studies using structuration theory do not consider the evolution of technology itself over time - an added dimension that makes the structure-agency duality three dimensional and non-linear (Greenhalgh & Stones, 2010). Thirdly, the assumption of relatively homogeneous actors poses a challenge when the scope of the study includes groups of heterogeneous actors. While these limitations have not posed serious threats to micro-level adoption studies, they form a major hindrance for a meso/macro level study, such as ours. In the next section, we outline the use of Strong Structuration theory (SST) and integrate it with Actor Network theory (ANT) to address these challenges.

2.2. Strong Structuration Theory

Strong structuration theory (SST) is an adaptation of structuration theory developed by Stones (Stones, 2005). SST adapts structuration theory for empirical work by introducing ontology-in-situ as “observing structures and action by agents in everyday occurrences of a conjuncture (a critical combination of events or occurrences)” (Greenhalgh & Stones, 2010). SST develops a quadripartite model for studying structuration using four components (Fig.1):

- 1) External-structures: comprising of acknowledged or unacknowledged (by the agent-in-focus) conditions of actions that lead to intended or unintended consequences through independent causal influences or irresistible external influences (Jack & Kholeif, 2007).
- 2) Internal-structures: representing agent's general-disposition that she draws upon and her conjuncture-specific knowledge through the role or the position occupied by her (Stones, 2005). SST also adopts Cohen's notion of position-practices, a set of structures and practices that a positional incumbent can do (Cohen, 1989),
- 3) Active-agency: constituting the actions taken by the agent-in-focus drawn either routinely or strategically from their internal structures (Greenhalgh & Stones, 2010).
- 4) Outcomes: that are the intended or unintended consequences as a result of active-agency and leading to the external and internal structures being either preserved or changed (Jack & Kholeif, 2007).

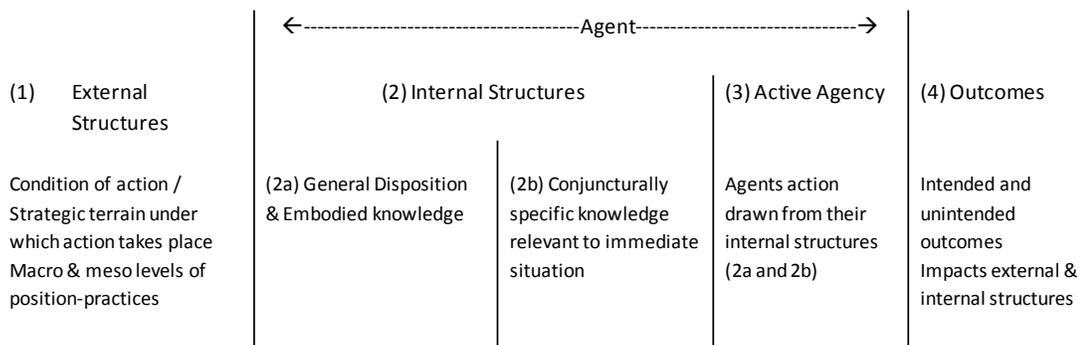


Fig 1: Quadripartite model of SST - adapted from (Greenhalgh & Stones, 2010)

In brief, SST suggests that agents bring in generic capabilities through their internal disposition and specific knowledge. 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 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 diffusion studies.

2.3. Strong structuration and Actor Networks

Diffusion theories are often criticized of assuming that technologies once established as best-practices will effectively spread through the population (Briers & Chua, 2001). Actor network theory (ANT) on the other hand views the success or failure of technology as a social accomplishment of human actors and non-human elements (Latour, 1987) and advocates that such heterogeneous networks are inherently dynamic and unstable. Stability is achieved through the process of translation that occurs through the four stages of a) problematization (issue causing instability is identified), b) intersement (other actors agree to the issue being a problem), b) enrollment (main actors are assigned roles and form alliances), and d) mobilization (actor network is extended beyond the initial group) (Callon, 1986). With stability, actor networks become “black-boxes” achieving a high degree of irreversibility and having material inscriptions, and with actors and actants assuming taken-for-granted status (Walsham & Sahay, 1999).

Rose (1998) points out that Giddens’ structuration theory does not address the technology dimensions and suggests the need for a careful combination of diverse theories in order to apply structuration to the IS discipline. A specific example of such a combination of theories is a study of GIS implementation in India (Walsham & Sahay, 1999) that combines structuration theory (as a sensitizing device) and ANT (as an empirical tool). Considering the gap in SST's analytical framework and the strength of ANT as a lens for studying technology driven changes, Greenhalgh and Stones (2010) suggest integrating these two theories. They do so by including technical actants into their list of agents-in-focus and expanding the concept of active agency to include actions taken by both actors and actants in a socio-technical network. Secondly, they expand the definition of internal structures by incorporating ANT's notion of material inscriptions in technology. Thus the internal structures, which per SST include human agents general disposition and conjuncture-specific knowledge, is enhanced to include technology's material properties, socio-cultural inscriptions and the conjuncture-specific functionality of these technologies (Greenhalgh & Stones, 2010). The resulting conceptual model developed by them is depicted in Fig 2.

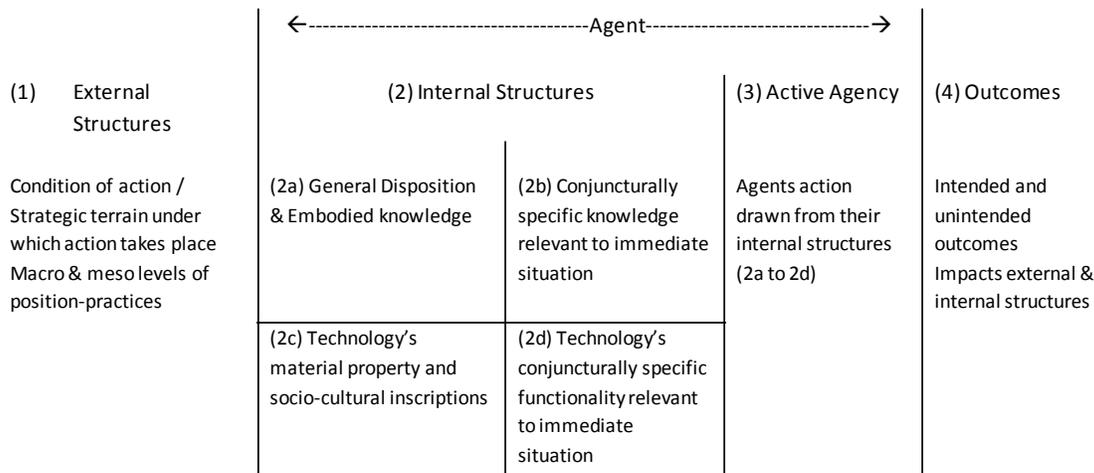


Fig 2: SST with technology dimension - adapted from (Greenhalgh & Stones, 2010)

In summary, Greenhalgh and Stones adoption of SST for studying socio-technical phenomena include a network of position-practices that comprises of both human actors and technologies. 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. Internal structures is embodied both by human and technological agents. Actions by human agents are influenced by their general disposition and conjuncturely specific knowledge while technologies influence actions through their material inscriptions and conjuncturely specific functionality. Human agents, influenced by these internal and external conditions of actions, either use the technology faithfully or 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. Theoretical Framework & Method

Following our arguments in the previous section on the challenges of conducting a technology assimilation study and the applicability of an integrated SST and ANT lens for conducting such a study, we adopt the guidelines provided by Greenhalgh and Stones as outlined in Fig 3.

1. Identify the various phases or conjunctures over which the organization undertakes the assimilation of technology. For each of these conjunctures, conduct the structuration study using the quadripartite model for analysis.
2. Determine the prevailing political, economic, technological and institutional context that form the external conditions of actions impacting the conjunctures.
3. Identify the socio-technical network comprising of agents and technologies
 - (a) For each of the agents in focus
 - i. Analyze their position-practices
 - ii. Evaluate the agents general disposition
 - iii. Evaluate the agents conjuncturally-specific knowledge including the understanding of the external structures, other agent's world view, technology's material property, its inscribed structures, and the functionality relevant to the situation
 - iv. Identify the key relationships that the agent has with other agents and technologies
 - v. Determine active-agency - the set of practices drawn on her general dispositions, conjuncturally-specific knowledge, and technological properties
 - (b) For each of the technology in focus
 - i. Analyze its material properties and the inscribed socio-cultural structures
 - ii. Determine the functions in use and how the inscribed structures enable, influence, or constrain active agency
 - (c) Determine the extent of the stability of the socio-technical network
4. Analyze the outcomes of the actions
 - (a) Determine the intended and unintended consequences
 - (b) The feedback of these consequences on the position-practices
 - (c) The significance of these consequences to other actors in the network
 - (d) The role of technology in producing these outcomes
 - (e) The implications of these consequences

Fig 3: Theoretical Framework

The analysis of the active agency is conducted across the heterogeneous set of actors participating in each conjuncture. The modified structures arising as a result of the outcome of each of these conjunctures is then used as an input to the 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 longer time duration.

We follow a case-study based approach for conducting our empirical analysis (Yin, 2009). The study was conducted at the end of the technology diffusion process through an analysis of historical information that was collected through semi-structured interviews. 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, store-staff, and enterprise-staff. Since the historical data required was over a large 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 interview were conducted in a few cases. While none of the interviews could be recorded, detailed notes were taken for each of the interviews.

To overcome the challenges of conducting an empirical study using structuration theory, Pozzebon and Pinsonneault (2005) recommend narrative studies using temporal bracketing. For studies involving multiple phases, a narrative strategy is often used as the primary analysis tool: for preparing the chronology and sequence of phases, and to establish the links between them (Langley, 1999). In our study too, we adopt a narrative strategy approach considering the need to first determine the different phases of adoption and then to interpret the links between the different clusters of actors and the technologies across these phases.

4. Organization's tryst with technology

In this section, we present a brief report on 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 into the retail business circa.1995 during the post-liberalization phase of the Indian economy when modern retail in India was still at its infancy (Sengupta, 2008). With a buoyant economy, the Indian consumer was increasing her spending and modern retail promised immense potential (Srivastava, 2008).

Internationally, retail can be considered as a mature industry with established business practices and information technologies. Most Indian retail firms partnered with international retailers as technology partners with an objective of bringing these business practices and technologies to India. However, Indian retailers were not able to adopt these international practices owing to country-specific challenges, such as: lack of qualified retail personnel, inefficient supply-chains, a weak IT eco-system, lack of understanding of consumer buying behavior, idiosyncrasies of the Indian consumer, and the requirements of India-specific formats (Dash & Chandy, 2009). In addition, functionality required to handle Maximum Retail Price (MRP) which legally prohibits retailers from charging customers above the MRP was not addressed by most international retail software systems. During this period, India also had an established and burgeoning IT services industry. Confident about the availability of qualified IT personnel, retailers unable to adopt international systems chose to develop their own IT systems.

India is known to be a nation of shopkeepers with a proliferation of unorganized retailers (Kachru, 2011). The supply-chain ecosystem in India is tuned to delivering goods to such a vastly distributed network (Dholakia, Dholakia, & Chattopadhyay, 2012) with manufacturers led by the FMCG sector having established last-mile logistics capabilities (Sengupta, 2008). With last-mile distribution costs being built into their pricing, manufacturers were unwilling to part with extra margins. While multi-store retailers in India intended to set-up their own centralized warehouse and distribution channels to gain supply-chain efficiencies, they usually started operations leveraging the direct-store-delivery facilities provided by FMCG manufacturers.

4.2. Technology adoption at Alpha

In accordance with the prevailing practices, Alpha also chose to develop its own IT systems and implemented a product called Retailer Enterprise Management (REM) during the years 1999-2000. REM functioned both as an enterprise management 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 to run their enterprise systems. The roll-out of SAP happened during 2006-2009 with REM continuing as the store POS system. The REM system was finally retired and the POS function migrated to a Wincor TP-Linux system by 2010-2011.

The adoption of technology at Alpha can be classified into the following phases or conjunctures: a) Conjuncture-1: conceptualization and initial adoption of REM; b) Conjuncture-2: rapid growth in scale of Alpha's business and associated changes to REM; c) Conjuncture-3: implementation of SAP; and d) Conjuncture-4: retirement of REM and the implementation of Wincor. The primary actors and the technologies participating in these conjunctures are as outlined in Fig.4.

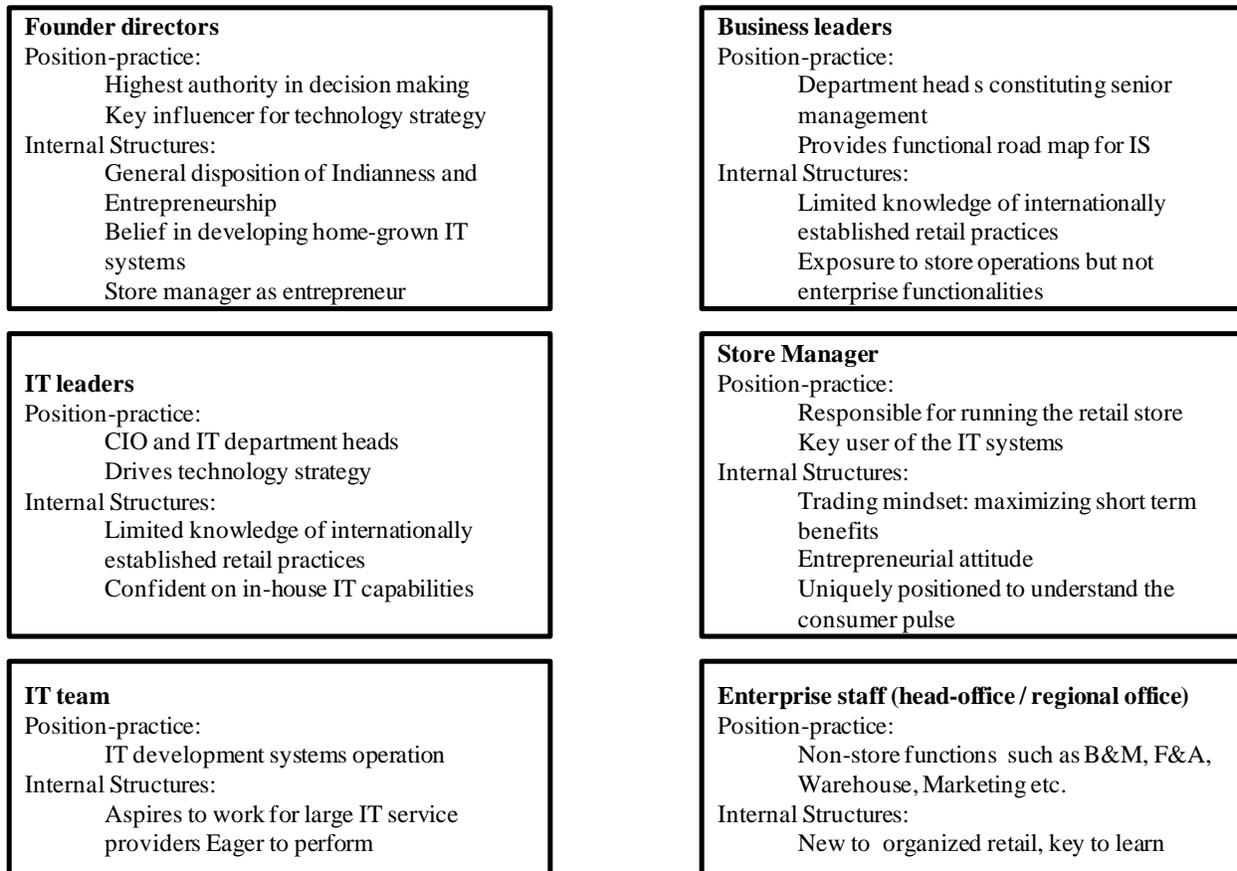


Fig. 4: Actors with their position-practices and internal structures

Conjuncture 1: The making of REM and its initial adoption.

The initial version of the IT system emerged as an in-house developed system catering to a largely store-focused functionality. Front-end promotion management emerged as a key functionality. Being a discount merchandiser, enticing consumers with attractive offers was a preferred way of selling. The store managers would assess the consumers' shopping needs and respond with impromptu promotions by modifying the selling price through back-end updates to the database. 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.

Indian consumer's demands are often thought to be complex, comprising of many unique parts based on cultural and linguistic identities (Bijapurkar, 2009). Alpha's background as an apparel manufacturer meant a superior capability in apparel merchandising. However, with diversification into multi-brand retailing, Alpha faced an acute shortage of category management capabilities in non-apparel merchandises. During such a time, store managers showed leadership in understanding the consumer needs and recommended appropriate merchandises. This resulted in selective enterprise functionalities such as master-data-management (MDM) and merchandise-receipt functions being built as store functionality.

Further, the result of adopting direct-store-delivery practices led to inventory discrepancies such as duplicate SKUs (stock-keeping-units), 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 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.

The technology in focus during this conjuncture is the REM software. The material property of this software can be summarized as being: highly malleable and customizable, and as a store-specific IT system with additional

enterprise functionality. The socio-cultural structures inscribed into this technology can be seen as comprising of a) promotion functionality: reinforces the belief of discount merchandising; b) manager's password: stood for the power and dominance of the store manager and the open access nature of the IT system; and c) manual billing: representing the suspect IT ecosystem.

The end of this conjuncture is marked by a rapid increase in store sales and the emergence of the store manager as the central agent in this growth. With the increasing demand of stores on IT maintenance activities, the store IT team size gradually increased and a dual reporting structure emerged.

Conjuncture 2: Rapid business growth and the need for an Enterprise Systems

The unfolding of this conjuncture occurred during 2001-2005 and was marked by a few key changes in the external conditions. Firstly, ERP systems such as SAP and Retek were making inroads into India. Secondly, retailers were now trying to establish centralized warehouses to achieve supply chain efficiencies and better margins (Srivastava, 2008). Thirdly, there was a growing expectation of a policy change allowing foreign direct investment in retail (Mukherjee & Patel, 2006). This created urgency among Indian retailers to achieve scale before the entry of foreign retailers.

With the increase in number of stores, centralized enterprise roles such as master data management (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 new business-intelligence (BI) function for consolidating data across the stores. The entry of this new system highlighted master-data and inventory related issues residing in the existing system, such as the inability to consolidate data across stores due to duplicate SKU codes. Further, REM lacked an archival functionality leading to ever increasing database sizes and associated performance issues. Severe performance issues were often addressed by adding memory/ processing power and suspending back-end functions during peak business hours. Such ad hoc measures had a cascading effect with further delays in inventory receipts leading to further inventory issues. Data discrepancies, performance issues and inefficiencies arising out of these escalated the need for an enterprise-wide system.

The executive management team took proactive steps to strengthen the IT leadership by inducting new actors. The new IT management advocated the need for replacing the enterprise functionality of REM by ERP systems. The POS functionality of REM was however thought to be suitable for business operations. The removal of enterprise functionality from the store was not seen, by the organization in general and the store managers in specific, as downgrading the responsibilities of the store manager. Instead, it was seen as releasing the bandwidth of the store manager to be productively used in increasing store sales.

Conjuncture 3: REM as a POS system

Conjuncture-3 unfolded during 2005-2009 with the roll-out of SAP across the business units. During this time, organized retail was establishing itself as a mature industry with several retailers adopting international practices including centralized warehousing and distribution, space management, and category management. This duration also saw the advancement of POS technology with integrated cash-registers, bill printers, barcode scanners, weighing machines and software.

The SAP system brought along with it internationally accepted practices. The enterprise staff, so far constrained by the limited functionality offered by REM, adopted SAP without much resistance. However, several functionalities in the new SAP system were in contradiction to the way they were implemented in REM. For example, the industry practice for promotions management was to have centralized promotions with the responsibility of defining and setting of the promotions residing with the B&M team. However, at Alpha, the store managers were given the right to decide on promotions. This conflict was addressed by allowing the B&M team create header level promotions (broad guidelines on the type of sales promotion per category/brand), with the actual execution of these promotions (i.e. decision on specific SKUs to be included under the header) being executed on the REM POS system by individual stores. 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. This led to three significant consequences: a) Alpha noticed a 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 leading to discontent among the 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) and running on Windows OS. The rapid scale-up in the number of stores meant that Alpha had not only to invest in the desktops and peripherals, but also had to buy licenses for Windows and Progress database (required for installing REM). This resulted in a growing need to adopt newer POS technologies such as those that ran on Linux, which offered the promise of not only providing an integrated system but also of being cost efficient.

Enterprise staff, so far constrained by the limitations of the REM system, found the SAP system that was inscribed with industry best practices as an enabler in meeting the demands of a fast maturing industry. However, as noted above, many of these inscriptions were in direct contradiction with those of the REM system. 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 other business heads on the need to retire REM and adopt an international POS product. This conjuncture ends with a decision to replace REM by Wincor POS system.

Conjuncture 4: 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. The impact on the checkout staff 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 the removal of access to key functionalities would impact their entrepreneurial empowerment.

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 to reposition the store manager. This can be seen as an attempt to reconfigure the store manager's positioning as an overall leader of the store. The introduction of the new POS system was also managed as a cultural activity: marking a new beginning with new philosophy, new machines, new software, and launched with a “pooja” (worship for prosperity).

The issue of managing promotions in the new system was critical to success. The first challenge was the resistance expected by the store manager due to loss of control. 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 with the store exercising promotions (once considered as a key strength) was due to the ad hoc nature in which it was being performed that was resulting in margin impacts. Shifting the activity to the back-office would lead to the dual advantage of making promotion management as a centralized activity and also incorporate feedback from stores. The need to plan promotions in advance was portrayed as a valid and reasonable constraint imposed by the system. A second issue faced was the limited promotion functionality offered by SAP as compared to the earlier REM system. This limitation was expected to make the task of setting promotions more difficult. A dedicated promotion-managed team was set-up to ensure that promotions were planned in advance, feedback sought from the stores and implemented in the SAP system.

Pilot implementation of Wincor faced a series of challenges including store resistance and data transfer issues between SAP and Wincor. Once these issues were resolved, the implementation was rolled out in one region, then to all regions under a format and subsequently to all the formats.

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 act of structuration as the organization adopts and assimilates technologies. Table 1 provides a summary of the analysis.

Conjuncture 1

The broad strategic terrain under which Alpha initiated its technology adoption involved the infancy of organized retail in India with the supply-chain predominantly catering to the unorganized markets (Mukherjee & Patel, 2006). While India's economy was experiencing post-liberalization benefits and India was emerging as a global IT

provider, the organized retail industry in India was still in its infancy with no mature practices and not yet ready to accept international retail software.

At a micro-level, we notice the actions of the founders and the senior management, driven by their general disposition (Indianness) and their understanding of the strategic terrain (inappropriate international products), leading to the adoption of in-house IT systems. We notice the impact of these actions on the position-practices resulting in the emergence of the store manager as the key agent-in-focus. We also notice how these micro-level actions resulted in REM evolving as a distributed system incorporating enterprise functionality. Workaround functions (such as manual overrides, back-end updates etc.) emerged for cases where the technology and agency were not aligned. Practices such as promotions, manual overrides, and back-end updates got inscribed into the IT systems. Over time, these inscriptions assumed a taken-for-granted status and became a way of functioning for the organization. At the end of the conjuncture, the actor network under study gained stability and led to a rapid increase in business.

Table 1: Quadripartite elements of SST as applicable to our study

Quadripartite Elements	Conjuncture 1	Conjuncture 2	Conjuncture 3	Conjuncture 4
External Structure	<ul style="list-style-type: none"> - Organized retail not an established industry - Opening-up of Indian Economy - India as a global IT provider 	<ul style="list-style-type: none"> - International ERP products entering Indian markets - Imminent entry of FDI in Retail 	<ul style="list-style-type: none"> - Maturing of organized retail practices - Entry of new generation POS hardware / software 	<ul style="list-style-type: none"> - No change
General Disposition	<ul style="list-style-type: none"> - Indianness and Entrepreneurship 	<ul style="list-style-type: none"> - No change 	<ul style="list-style-type: none"> - Entry of global actors to IT leadership team 	<ul style="list-style-type: none"> - No change
Conjuncturally specific knowledge	<ul style="list-style-type: none"> - Apparel retailer - Lack of multi-format retail expertise - Discount merchandiser 	<ul style="list-style-type: none"> - No change 	<ul style="list-style-type: none"> - Organizational scaling needs enterprise management skills 	<ul style="list-style-type: none"> - Global IT leaders with past experience in similar environment - Successful SAP implementation leading to trust in international products
Material property and Social Inscriptions	<ul style="list-style-type: none"> - Malleable software 	<ul style="list-style-type: none"> - Open access - Runtime promotions 	<ul style="list-style-type: none"> - Retail best practices incorporated in SAP - No changes in REM's inscriptions - Conflict between these two sets of inscriptions 	<ul style="list-style-type: none"> - Opposing inscriptions between REM and Wincor systems - Wincor requiring design time changes, not as malleable
Conjuncturally specific functionality	<ul style="list-style-type: none"> - Manual billing - Promotions management - Enterprise functions at store 	<ul style="list-style-type: none"> - Consolidation across stores - Conflict between front-end and backend functions - Need for BI functionality - Scalability and performance issues 	<ul style="list-style-type: none"> - Promotions in SAP executed unfaithfully at the stores - Manual billing leading to inventory issues - Incorrect promotions leading to loss of margins 	<ul style="list-style-type: none"> - Integrated POS functionality with touch-screen features - Faster check-out processing time - Limited promotions functionality

Conjuncture 2

In this conjuncture we notice a significant change in the strategic terrain: including the acceptance of ERP products by the Indian retailers, the opening up of the Indian economy, and the impending policy change. At a micro-level, we notice technological limitations leading to the addition of a BI system to the actor network. In ANT terminology, the punctualized state that REM achieved in conjuncture-1 gets broken with the introduction of the BI system. The addition of the BI functionality exposed the deficiencies of the underlying components of REM including POS, MDM and Inventory systems leading to a breakdown of the network.

The IT department heads, influenced by the strategic terrain (need for scaling-up and entry of ERP) and drawing from their conjuncturally specific knowledge (altered actor network), advocate the use of ERP systems. This results in the translation of the actor network with the inclusion of a new technology (SAP) and associated actors (enhanced

enterprise roles). We also notice that the REM POS system, with its sets of allies and inscriptions, continued to be reasonably frozen.

Conjuncture 3

Conjuncture-3 unfolded over a period of four years and saw some incremental changes in the strategic terrain with the entry of new generation POS systems. We also notice the polarization of the actor network into two parts: one centered on SAP incorporating enterprise actors; and the other centered on REM including the store actors. This leads to an altered position-practice: with the enterprise staff supported by a superior technology feeling empowered; and the slightly compromised position-practice of the store manager who had to relinquish control of several activities.

The conflict between the inscriptions of the two technological actants also surfaces in this conjuncture. The resulting agency actions lead to the final break-down of the REM system. The failure of the integration layer between REM and SAP, and the escalating licensing costs leads to further breakdown of the actor network. The REM POS system that had thus far achieved a status of being an immutable mobile is now exposed to reveal its functional and technical components.

With SAP system in place, the IT leadership team was strengthened by new global actors who brought with them significantly different disposition and knowledge. The agency initiated by these global players, drawn from their internal structures, their understanding of the modified strategic terrain, and the internal structures of other actors, led to active problematizing of the POS functionality. 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 system.

Conjuncture 4

There are no additional changes to the broad strategic terrain witnessed in this conjuncture. However, this conjuncture witnessed a series of micro-level actions leading to irreversible change to the IT landscape at Alpha. The Wincor system came with functionality that inscribed internationally established practices, several of which were complete opposites to those of REM. Thus, 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 and was seen as denting the entrepreneurial spirit enjoyed by them.

Ensuring the stability of the new actor network required the alignment of the store managers with the Wincor system. The internal structures of the store managers are seen to be driven by their disposition of entrepreneurship and their dominant position reinforced over several years. The acceptance of Wincor system by the store manager required a significant change to their internal structures. 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 and performing “Pooja” (a religious ceremony). These incidents can be seen as an active agency to alter the general disposition of the store staff.

Thus, the outcome of conjuncture-4 can be summarized as re-establishing a stable actor network and an altered position-practice of both the enterprise and the store staff. This conjuncture is marked by agency carried out by various actors: ranging from the role of the leadership team to alter the disposition of the store staff, re-launching of the stores, role of global actors in introducing new technology actants with aligned inscriptions, and the process of aligning the technology's function-in-use to those of the actors needs.

6. DISCUSSIONS & CONCLUSIONS

In this paper, we have attempted to study the technology adoption by an organization as it establishes itself in the emerging retail industry in India. Our choice of retail industry provides us a 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, evolving organizational contexts and technologies during the adoption process.

The primary 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 & Poole, 1994); or to explain adaptations to the development process such as the study of global virtual teams (Maznevski & Chudoba, 2000) and adaptation to agile methodologies (Cao, Kannan, Peng, & Balasubramaniam, 2009). In our study, we demonstrate the impact of micro-level structuration process between technology and human actors unfolding in an organizational and industrial context, and translating into a macro-level impact on the technology assimilation process.

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, in combination, 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.

Our study also indicates that the technology assimilation process is more than just awareness, adoption, and deployment of technologies. It is an ongoing process occurring over an extended period of time and involves a series of successes and failures. The process we elaborated is similar to Gersick's punctuated equilibrium model (Gersick, 1991) which views change as long periods of stability (with incremental change) and brief periods of revolutionary change. Past IS researchers have used the concepts of punctuated equilibrium to understand problems of system-development (Newman & Robey, 1992), virtual teams (Jarvenpaa, Shaw, & Staples, 2004), adoption of new technologies (Loch & Huberman, 1999), technology-led organizational transformation (Orlikowski, 1996), to name a few. Our study contributes to this literature to establish the usefulness of the punctuated equilibrium model to a macro-level technology adoption process within an organization.

As an implications for practice, our study points to the constant need for realigning technology with organization needs as is evident from the actor networks toggling between stability and instability. Our study suggests that a successful technology at a given moment of time may outlive its utility in the future. Such failures may be as a result of the misalignment of 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 disposition of key actors), and realigning roles & responsibilities (altering position-practices).

We adopted a grounded theory approach to our study. We grew a theoretical basis as we developed an understanding of the phenomena, similar to past contextual studies such as those of Walsham and Sahay (1999). The choice of SST was decided upon only during the analysis phases, and the conjunctures were determined by logically grouping the events based on the technology-in-use. This study would benefit by adopting qualitative coding techniques (Miles & Huberman, 1994; Strauss & Corbin, 1990) that could aid in triangulating the boundaries of the conjunctures. We hope to address this as an extension to this study.

The extent to which we can generalize the research findings is a possible limitation of our study. A proposed extension to our study is to include additional cases that involve organizations that have undertaken different paths of technology adoption under similar contexts. This could be done through a theoretical sampling of additional organizations in the retail industry in India, or include cases from other emerging industries with similar contexts.

7. REFERENCES

- Bijapurkar, R. (2009). *We are like that only: Understanding the logic of consumer India*. Portfolio Penguin.
- Briers, M., & Chua, W. F. (2001). The role of actor-networks and boundary objects in management accounting change: a field study of an implementation of activity-based costing. *Accounting, Organizations and Society*, 26(3), 237-269.
- Callon, M. (1986). Some elements of a sociology of translation: Domestication of the scallops and the fisherman of St. Briene Bay. In J. (. Law, *Power, Action and Belief A New Sociology*. London: Routledge.
- Cao, L., Kannan, M., Peng, X., & Balasubramaniam, R. (2009). A framework for adapting agile development methodologies. *European Journal of Information Systems*, 18, 332-342.

- Cohen, I. (1989). *Structuration Theory: Anthony Giddens and the Structuration of Social Life*. London: Macmillan.
- Dash, M., & Chandy, S. (2009). A study on the challenges and opportunities faced by organized retail players in Bangalore. Available at SSRN 1435218.
- DeSanctis, G., & Poole, M. (1994). Capturing the complexity in advanced technology use: adaptive structuration theory. *Organization Science*, 2(5), 121-147.
- Dholakia, N., Dholakia, R. R., & Chattopadhyay, A. (2012). India's Emerging Retail Systems Coexistence of Tradition and Modernity. *Journal of Macromarketing*, 32(3), 252-265.
- Fichman, R. G. (2000). The diffusion and assimilation of information technology innovations. In *Framing the domains of IT management: Projecting the future through the past* (pp. 105-128).
- Gersick, C. J. (1991). Revolutionary change theories: A multilevel exploration of the punctuated equilibrium paradigm. *Academy of management review*, 16(1), 10-36.
- Giddens, A. (1984). *The Constitution of Society: Outline of the Theory of Structure*. Berkeley, CA: University of California Press.
- Greenhalgh, T., & Stones, R. (2010). Theorising big IT programmes in healthcare: strong structuration theory meets actor-network theory. *Social Science & Medicine*, 70(9), 1285-1294.
- Jack, L., & Kholeif, A. (2007). Introducing strong structuration theory for informing qualitative case studies in organization, management and accounting research. *Qualitative Research in Organizations and Management: An International Journal*, 2(3), 208-225.
- Jarvenpaa, S., Shaw, T., & Staples, D. (2004). Toward Contextualized Theories of Trust: The Role of Trust in Global Virtual Teams. *Information Systems Research*, 15(3), 250-267.
- Kachru, U. (2011). *India Land of a Billion Entrepreneurs*. Pearson Education India.
- Karsten, H. (1995). It's like everyone working round the same desk: organizational readings of Notes. *Scandinavian Journal of Information Systems*, 7(1), 7-34.
- Langley, A. (1999). Strategies for theorizing from process data. *The Academy of Management Review*, 24(4), 691-711.
- Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Harvard University Press.
- Loch, C., & Huberman, B. (1999). A Punctuated Equilibrium Model of Technology Diffusion. *Management Science*, 45(2), 160-177.
- Maznevski, M., & Chudoba, K. (2000). Bridging space over time: Global Virtual Team Dynamics and Effectiveness. *Organization Science*, 11(5), 473-492.
- Miles, M., & Huberman, A. (1994). *Qualitative Data Analysis: An expanded sourcebook*. Thousand Oaks, CA: Sage.
- Mukherjee, A., & Patel, N. (2006). *FDI in Retail Sector: INDIA: A Report by ICRIER and Ministry of Consumer Affairs, Government of India*. Academic Foundation.
- Newman, M., & Robey, D. (1992). A Social Process Model of User-Analyst Relationships. *MIS Quarterly*, 16(2), 249-266.
- Orlikowski, W. J. (1992). The Duality of Technology: Rethinking the Concept of Technology in Organizations. *Organization Science*, 3(3), 398-427.
- Orlikowski, W. J. (1996). Improvising organizational transformation over time: A situated change perspective. *Information systems research*, 7(1), 63-92.
- Orlikowski, W. J., & Scott, S. V. (2008). Sociomateriality: Challenging the separation of technology, work and organization. *The Academy of Management Annals*, 2, 433-474.
- Pozzebon, M., & Pinsonneault, A. (2005). Challenges in conducting empirical work using structuration theory: Learning from IT research. *Organization Studies*, 26(9), 1353-1376.

- Rose, J. (1998). Evaluating the contribution of structuration theory to the information systems discipline. *6th European Conference on Information Systems*. Granada.
- Sengupta, A. (2008). Emergence of modern Indian retail: an historical perspective. *International Journal of Retail & Distribution Management*, 36(9), 689-700.
- Srivastava, R. K. (2008). Changing retail scene in India. *International Journal of Retail & Distribution Management*, 36(9), 714-721.
- Stones, R. (1996). *Sociological Reasoning: Towards a Past-Modern Sociology*. London: Macmillan.
- Stones, R. (2005). *Structuration theory*. Basingstoke: Palgrave-Macmillan.
- Strauss, A., & Corbin, J. (1990). *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. Newbury Park, CA: Sage.
- Walsham, G., & Sahay, S. (1999). GIS for District-Level Administration in India: Problems and Opportunities. *MIS Quarterly*, 23(1), 39-65.
- Yin, R. (2009). *Case Study Research: Design and Methods (3rd ed.)*. Thousand Oaks, CA: Sage.