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The Dilemma of Integration versus Autonomy: Knowledge Sharing in Post-Merger Information System Development

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Résumé

Les fusions représentent un outil stratégique majeur dans le développement ou le repositionnement d'une organisation. Nonobstant les bénéfices apportés par les fusions, les résultats sont souvent peuplés de problèmes tels que le haut niveau de stress chez les employés, l'insatisfaction ou la résistance. La recherche a tendance à imputer ces problèmes à la question de la gestion des frontières, c'est-à-dire au degré d'intégration requis auprès des parties en fusion et au degré d'autonomie, que chacune d'entre elles doit conserver lors de la fusion afin de favoriser les synergies potentielles. Bien que la recherche reconnaisse le rôle joué par les systèmes d'informations (SI) lors d'une fusion, elle n'a toutefois pas abordé la question de la gestion des frontières durant la phase de développement des SI destinés à appuyer les organisations qui ont fusionnées. En effet, il a été démontré, bien que dans un autre contexte que celui des fusions, que le partage des connaissances est crucial et particulièrement difficile lors du développement des systèmes d'information (DSI) impliquant des agents de communautés différentes. Indépendamment du degré d'intégration adopté lors d'une fusion, de nouveaux SIs qui repousseront les frontières des organisations préalablement indépendantes devront être développés. Ces développements impliqueront les acteurs de chacune des organisations préalablement indépendantes.

Dans cette thèse nous nous sommes basés sur des données d'une étude par cas multiple provenant du développement de trois projets SI au sein d'un large centre de santé résultant d'une fusion. En effet, nous avons voulu adresser les questions de comment les agents présents dans les organisations qui ont fusionné et qui ont participé activement dans un DSI pendant la phase d'intégration post-fusion, partagent leurs connaissances concernant les pratiques de travail requises dans le cadre d'une approche d'intégration post-fusion, et sur la façon dont les fonctionnalités des SI qui en résultent sont affectées par la compréhension des agents des pratiques de travail des autres.

En adoptant une perspective de pratique, nous avons amené une structure multi-niveaux qui est à la base du cadre théorique pour le développement d'une théorie des

processus sur le partage des connaissances pendant les projets DSI post-fusion. Dans une perspective de pratique, la connaissance est considérée comme étant partie intégrante des pratiques quotidiennes et les individus (ou agents) partagent un ensemble de pratiques de travail au sein du même champ de pratique (i.e. les unités d'affaire, les départements ou les groupes orientés sur les objectifs) et poursuivent le même intérêt conjoint. Les frontières sont alors définies comme des limites objectives qui distinguent les agents à partir de leurs différences dans leurs pratiques. Là où les pratiques ne sont pas partagées, les individus ont des hypothèses et des interprétations différentes du contexte organisationnel. Construit sur la théorie de pratique de Bourdieu (1977), sur les approches typologiques d'intégration de Ellis (2004) et sur l'analyse relationnelle des frontières des connaissances de Carlile (2002, 2004), ce cadre théorique examine les relations entre les individus, les approches d'intégration post-fusion et les types de frontières de connaissance dans trois propriétés relationnelles de connaissance à la frontière : les différences, les dépendances et la nouveauté. Nous avons aussi pris en considération d'autres facteurs qui pourraient former un processus de partage de connaissances tel que les différences de statuts, les objets de frontière et les agents de liaison (*boundary spanners*).

La théorie de processus présentée, basée sur six propositions dont trois amenées par le cadre théorique et trois autres émergées des analyses de données, nous a aidé à identifier un dilemme d'intégration à l'opposé d'autonomie au cours du développement de SI dans les paramètres d'intégration post-fusion. Les résultats amenés montrent que le mélange de différents degrés d'intégration pourrait représenter une réponse appropriée à ce dilemme et que le processus de partage des connaissances au travers des frontières, dans un contexte d'intégration post-fusion, est affecté par les différences de pratiques, les bases de la connaissance, les statuts des individus, les hypothèses et les symboles organisationnels. Notre théorie, par ailleurs, a confirmé que les niveaux d'analyse micro et macro peuvent être simultanément étudié en focalisant sur comment les phénomènes macro sont influencés par des interactions de niveau micro, et comment ces interactions, en retour, sont transformées par les influences macro. Les résultats ont montré que les évènements décisionnels à un niveau organisationnel, tel que le choix du degré d'intégration, ont eu un impact sur comment

une fonctionnalité des nouveaux SIs a été développée dans une perspective de groupe, et sur comment ces évènements de niveau organisationnel, en retour, ont été transformés par les évènements de niveau groupe.

La théorie amenée dans cette thèse contribue autant à la recherche qu'à la pratique en développant notre compréhension des pratiques courantes de partage de connaissances pendant des projets de développement SI et en offrant des points de vue sur les compromis impliqués dans de telles pratiques au sein d'un contexte organisationnel spécifique d'intégration post-fusion.

Mots-clés : approches d'intégration post-fusion, perspective de pratique, frontières, propriétés relationnelles, statut, objets de frontière, agents de liaison, méthodes qualitative

Abstract

Mergers are a major strategic tool for business growth and repositioning. Notwithstanding the mergers' expected benefits, their outcomes are often beset by problems such as employees' high levels of stress, dissatisfaction and resistance. Research suggests that these problems are often related to the issue of boundary management, which refers to the degree of integration required among the merging parties and the degree of autonomy, that each must retain for the merger to achieve potential synergies. Although research acknowledges the role of information systems (IS) in a merger, it has not addressed the issue of boundary management during the development of ISs aimed at supporting merged organizations. Yet, it has been shown, albeit not in a merger context, that knowledge sharing during IS development (ISD) involving agents from different communities is critical and difficult. Irrespective of the degree of integration adopted for a merger, new ISs that will span the boundaries of previously independent organizations will have to be developed. These developments will involve actors from each previously independent organization.

In this thesis we drawn on data from a multiple-case study of three IS development projects within a large healthcare centre resulted from a merger to address the questions of how agents from merging organizations, engaged in an ISD during post-merger integration (PMI) share knowledge of the work practices required by a specific PMI approach, and of how the resulting IS functionality is affected by the agents' understanding of the work practices of the others.

Adopting a practice perspective, we advanced a multi-level theoretical framework that constituted the blueprint for developing a process theory of knowledge sharing during post-merger ISD projects. In a practice perspective, knowledge is considered as being integral part of daily work practices and individuals (or agents) share a set of work practices within the same field of practice (e.g. business units, departments or goal-driven groups) and pursue a joint interest. Boundaries are defined as objective limits that distinguish agents based on differences in their practices. Where practices are not shared, individuals have different assumptions and interpretations of the organizational context. Built on Bourdieu's (1977) practice theory lens, Ellis' (2004) typology of

integration approaches and on Carlile's (2002, 2004) relational analysis of knowledge boundaries, the framework examines the relationships between individuals, different PMI approaches and types of knowledge boundaries along three relational properties of knowledge at the boundary: differences, dependencies, and novelty. It also took into consideration other factors that may shape the process of knowledge sharing such as status differences, boundary objects, and boundary spanners.

The proposed process theory, based on six propositions, three advanced by the theoretical framework and three others that emerged from data analyses, helped us to identify a dilemma of integration versus autonomy when dealing with IS development in PMI settings. The results showed that a mix of different degrees of integration might be the appropriate answer to this dilemma and that the process of cross-boundary knowledge sharing in a PMI context is affected by differences in practices, knowledge bases, individual status, assumptions, and organizational symbols. Our theory also confirmed that micro- and macro-levels of analysis can be simultaneously examined by focusing on how macro-phenomena are influenced by micro-level interactions, and how these interactions, in turn, are shaped by macro-influences. The results showed that organizational-level decisional events, such as the choice of degree of integration, had an impact on how the functionality of new ISs was developed at a group level, and how those organizational-level events, in turn, were shaped by the group-level events.

The theory advanced in this thesis contributes to both research and practice by increasing our understanding of current practices of knowledge sharing during IS development projects and by offering insights into the tradeoffs involved in such practices engaged in the specific organizational context of post-merger integration.

Keywords: Post-merger Integration Approaches, Practice Perspective, Boundaries, Relational Properties, Status, Boundary Objects, Boundary Spanners, Qualitative Methods

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List of Abbreviations

IS	Information Systems
ISD	Information Systems Development
IT	Information Technology
PMI	Post-merger Integration

To my son, Noah
and my mother, Cornelia

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CHAPTER 1: Introduction

Mergers are a major strategic tool for business growth and repositioning (Schweiger and Goulet 2000). Mergers and acquisitions (M&A) have periodically attracted academic interest as waves of mergers have emerged. After a brief decline between 2000 and 2002, global M&A activity has been on the rise, with deals totaling $3.51 trillion in 2006 and $3.74 trillion in 2007 (Mergerstat 2008). A *merger* usually involves the full amalgamation of two or more separate organizations into a new organization (Marks and Mirvis 2001). The term *acquisition* refers to the purchase of a target organization for absorption into the acquiring organization. The literature, be it in management, economics, business history, industrial organization, or finance generally holds the term "merger" to include both phenomena (Marchildon 1991). Hence, this study will use the term *merger* instead of M&A.

Private firms are not only motivated by economic incentives such as better market positioning and increased return on capital (Haspeslagh and Jemison 1991) but also by non-economic reasons such as political power or managers' personal interests (Trautwein 1990). Public organizations, such as hospitals in many countries, are driven by regulatory forces, adherence to generally accepted practices, or by a concern for better control of resources and the maintenance of organizational or individual autonomy and power (Comtois, Denis and Langley 2004).

The literature identifies three phases of a merger: courtship or pre-merger, merger decision and post-merger integration (Marks and Mirvis 2001). The first two phases comprise the strategic and financial analyses that determine the potential benefits or synergies; post-merger integration (PMI) constitutes the process of actual value-creation (Haspeslagh and Jemison 1991). The merger value or synergy represents the "actual net benefits" (reduced cost per unit, increased income, etc.) that will hopefully materialize when the organizations are combined (Larsson and Finkelstein 1999: p.3). While mergers have been a major strategic tool for business growth and repositioning in recent decades (Hitt, Harrison and Ireland 2001; Javidan, Pablo, Singh et al. 2004), they are often beset by emerging problems during the PMI phase such as employees' high levels of stress, job dissatisfaction, and resistance to the merger (Larsson and Finkelstein 1999). These problems have been attributed to the fact that management does not always take into account some of the differences among the

merging parties, such as norms, values, and managerial practices (Greenwood, Hinings and Brown 1994).

Research on PMI reveals that when trying to manage differences among the merging parties, organizations face the dilemma of integration versus autonomy, which Haspeslagh and Jemison (1991) call "the issue of boundary management" (p.142). This refers to how much integration of, and how much autonomy among the merging parties is needed to achieve potential synergies. A number of researchers have addressed this dilemma by proposing typologies of integration approaches based on strategic and organizational dimensions (e.g. Haspeslagh and Jemison1991; Nahavandi and Malekzadeh 1988; Marks and Mirvis 2001). The literature on PMI suggests that one can identify four primary integration approaches (Ellis 2004): 1. *Absorption* – involves full integration by suggesting that one of the firms will require the other merging party to adopt its work practices, norms and culture; 2. *Preservation* – entails pre-merger status quo of the organizational differences of the merging firms; 3. *Symbiosis* – presents a more complex design: at the beginning of the post-merger phase, the organizations coexist by having a high level of autonomy, and then gradually, they are combined by enforcing an increasingly operational interdependence and a common culture; 4. *Transformation* – is applicable in the case of merging firms that decide to implement work practices and a common organizational structure that are new to all merging parties.

Recent empirical PMI studies have shown that some merging organizations have dealt with the "issue of boundary management" by concurrently implementing a mix of different integration approaches that, while ensuring a specific level of organizational autonomy for some business units, provides coordination mechanisms to enable efficient work practices and knowledge sharing for other business units (Schweizer 2005; Ranft and Lord 2002).

The literature on PMI remains silent on the dilemma of integration versus autonomy when dealing with the information technology of the merging parties. Indeed, even though as early in 1992, authors were arguing that differences in IT must also be accounted for when planning and implementing the post-merger phase (Buck-Lew, Wardle and Pliskin 1992), information systems (IS) researchers have not addressed this dilemma. Instead, the focus of their studies is mainly on the processes

of change in post-merger IT strategies. In line of research, the authors identify effective strategies for integrating the merging entities' IT functions (Giacomazzi, Panella, Pernici et al. 1997; Johnston and Yetton 1996) or analyze the alignment of the post-merger IT function with the business needs (Wijnhoven, Spil, Stegwee et al 2006; Mehta and Hirschheim 2007).

The IT practitioner literature on PMI, however, suggests that such a dilemma exists at the IS/IT level in PMI settings. Some firms, fearing costs and complexity, never integrate their information systems and therefore synergy gain is minimal. Others focus on the potential synergy gains and without much planning, implement an absorption approach by choosing one information system over another, often frustrating both customers and employees (Aberg and Sias 2004). This literature also suggests that organizations should deal with this dilemma by designing and developing appropriate ISs that would help them implement different business integration approaches (Worthen 2007). In terms of if and how much it needs to integrate the post-merger IT functions and what kind of ISs need to be developed, Gartner (2005) recommends that IT management would be in a better position to make a decision in these matters if it had access to the correct information and understood how business processes work. While these reports pinpoint the importance of implementing systems that are flexible enough to accommodate different degrees of integration among the merging organizations, they don't elaborate on the challenges and means of developing such systems.

Given the potentially important role that IS can play in the post-merger phase, the successful development of ISs that are to support the merged organizations is a critical issue. This thesis addresses this issue by focusing on the process of IS development (ISD) during the post-merger phase.

The ISD literature has traditionally linked the success of systems development initiatives to the effective collaboration and knowledge sharing among individuals that are members of different professional communities (Suchman 2002; Karsten, Lyytinen, Hurskainen et al. 2001; Levina and Vaast 2006). The topic of knowledge sharing among individuals and organizations has been the focus of an important body of research via two main theoretical lenses (Cook and Brown 1999). The first lens considers knowledge as being something that can be possessed. In this line of

reasoning, knowledge is seen either as an object that can be transferred within and across the boundaries of an organization, or as an individual or collective subjective disposition. The second lens, informed by the practice perspective, defines knowledge as an integral part of daily work practices. In IS research, the practice perspective has helped scholars shed light on how ISs may be developed and used to enable business processes that span intra-organizational boundaries (Suchman 2002; Levina and Vaast 2006). Thus, in this thesis, although we will review both perspectives, we adopt a practice lens to study knowledge sharing during IS development in a PMI context.

Practices represent "the way in which work gets done and […] knowledge is created" (Brown and Duguid 2001: p.200). Practices are based on contextual knowledge that includes local, professional and organizational norms, individual and collective know-how, group stories, and shared conventions (Cook and Brown 1999). In this perspective, boundaries are defined as objective limits that distinguish agents based on differences in their practices (Bourdieu 1977; Levina and Vaast 2005). Where practices are not shared, individuals have different assumptions, outlooks and interpretations of the organizational context. Thus, cross-boundary knowledge sharing involves the negotiation of multiple domains of knowledge by the professional community members that usually have an understanding of only part of the other domains beside their own communal domain of knowledge (Boland and Tenkasi 1995; Brown and Duguid 1998).

A number of studies show that knowledge sharing is a difficult task. Organizations face challenges such as how to motivate employees to share knowledge (Wasko and Faraj 2005), instill positive attitudes towards knowledge sharing (Bock, Zmud and Kim 2005), create trust (McEvily, Perrone and Zaheer 2003), or bridge different work practices (Brown and Duguid 2001). While, as the above suggests, knowledge sharing among the members of a single organization is difficult, it is even more challenging in a PMI context, since the actors involved abide by different local, social and cultural rules based on different organizational contexts (Empson 2001; Schweizer 2005). Notwithstanding the critical importance of post-merger knowledge sharing (Yoo, Lyytinen and Heo 2007) and IS integration (Mehta and Hirschheim 2007), and the challenge to share knowledge during ISD efforts (Orlikowski 2002; Levina and Vaast 2005), our literature review did not reveal any studies that focus on

understanding the process of knowledge sharing during the post-merger development of IS.

Given this, our thesis will adopt a practice lens to study the dynamics of knowledge sharing during the development of IS in a PMI context. More precisely the two main research questions will be:

- *How do agents from merging organizations, engaged in an IS development during PMI, share knowledge of the work practices required by a specific PMI approach?*
- *How do interactions among agents engaged in knowledge sharing during IS development in PMI, influence the resulting IS functionality?*

These questions were studied in the particular context of the healthcare milieu. The chosen setting for the three cases was a large Canadian teaching healthcare centre that has emerged from the amalgamation of five independent hospitals. The post-merger phase of a public sector hospital presents unique characteristics, such as departmental "micro-mergers" (Denis, Lamothe, and Langley 1999) that reflect what Schweizer (2005) calls, a hybrid integration approach. The choice of the site was also influenced by the fact that the researcher has significant experience in IT-related work in the healthcare milieu and, as an insider of this organization, had direct and privileged access to the sources of data and was able to provide important knowledge about what the organization was really like. The main advantage of being a "native" is that the researcher's "deeper and more profound knowledge of the setting may lead to theoretical development that is better grounded in experiences and observations than is common" (Alvesson 2003: p.178). However, the "native" researcher may find himself caught between loyalty tugs, behavioral claims, and organizational identification dilemmas (Stephenson and Greer 1981). When the research site is also the researcher's employer, care must be taken to identify and isolate the researcher's bias (Lincoln and Guba 1985). To alleviate such predicaments, the data were collected from ISD projects where the researcher had not been involved and we tried to be self-aware about personal assumptions, values and biases.

Conducting a qualitative multiple-case study within a single merging organization helped us to develop a process theory on the dynamic relationships between individuals, boundaries, and PMI approaches during the post-merger development of IS. The cases involved three information system development and implementation projects: Patient Appointment Scheduling, Laboratory, and Clinical Information Management. We began our theory-building effort by using within-case analysis to allow unique patterns of each case to emerge. For this analysis we applied a temporal bracketing strategy (Langley 1999). We further used analytic induction in the cross-case analysis to uncover new constructs and relationships that could enrich our understanding of the phenomenon and assist our theory building process (Patton 2002). The results showed that the challenge for knowledge sharing across boundaries during IS development in a PMI context arises from sources of distinction separating the merging parties: differences in practices, knowledge bases, amount of individual capitals, assumptions, values, and organizational symbols.

This research contributes to the IS literature on PMI by providing an in-depth examination of the dilemma of integration versus autonomy that can impact knowledge sharing in post-merger ISD. It proposes a practice perspective-based framework to explain the outcomes of the three ISD processes in terms of final IS functionality by examining the practices that these ISs were supposed to reflect. This work contributes to the organization literature on practice perspective by providing an additional, detailed example of its application in a specific organizational context, the PMI, and illustrating its utility in the investigation of a complex organizational phenomenon. In addressing the practitioners, first, this research emphasizes the importance of developing ISs with functionalities that enable post-merger business processes. Second, it argues that, when making IT integration decisions, management should consider if post-merger IS development initiatives will have the capability to foster effective collaboration among stakeholders.

The rest of the thesis is organized as follows: in Chapter 2 we start to define our theoretical foundation by reviewing the literature on post-merger integration with a focus on IT integration and the issue of boundary management. This literature provided the concepts that helped us approach the first research question. Then, we continue by reviewing the main perspectives on knowledge sharing. One of these

perspectives, based on the practice perspective, is emphasized and tied to the existing literature on knowledge sharing in PMI settings. The practice perspective was used as a theoretical lens through which we tried to find the answers to both research questions. Chapter 3 is dedicated to developing a conceptual framework that constituted the analytical tool for studying knowledge sharing practices during the process of post-merger development of IS. Chapter 4 explains and describes the methodological approach that was used in our study. We discuss the choice of the research site and the data collection process. We then focus on how the data was analyzed followed by a discussion on the potential ethical issues related to the methodology. Chapter 5 presents the results of the within- and cross-cases analyses. Chapter 6 is dedicated to the discussion of the results. Finally, in Chapter 7 we present conclusions and the implications of our theory for practitioners and researchers. Limitations and directions for future research conclude the chapter.

CHAPTER 2: Theoretical Background

Mergers have been studied by academics through various theoretical lenses. Four schools of thought dominate the literature on mergers, each of which has distinct theoretical foundations and central hypotheses: 1. Finance and Economics; 2. Strategy; 3. Organizational structures perspective; and 4. Integration Design perspective (Haspeslagh and Jemison's 1991)[1]. The *Finance and Economics* school is concerned with potential wealth creation by proposing different economic models. The *Strategy* school advances the concept of strategic "fit" which is defined as "the degree to which the target firm augments or complements the parent's strategy" (Jemison and Sitkin 1986). Through the concept of "relatedness", this perspective relates strategic "fit" to stock market-based performance metrics. These two schools focus mainly on the pre-merger and merger phases. Studies that use the *Organizational Structures* perspective advance the concept of organizational "fit" to refer to the similarities between the administrative and cultural practices of merging firms as well as personnel characteristics (Datta 1991; Sales and Mirvis 1984). This stream of research focuses on the post-merger effects of the impact of the mergers on organizational structures and work relationships and how individuals respond to merger issues (Haspeslagh and Jemison 1991). Finally, the *Integration Design* perspective provides an analytical construction of the integration process. Post-merger integration is defined as the mechanism of coordination of the activities of the merging organizations to bring to fruition the potential synergy identified in the courtship phase (Shrivastava 1986; Birkinshaw, Bresman, and Håkanson 2000). The researchers in this stream of research focus on the level of integration that can be defined as being "the degree of post-merger change in an organization's technical, administrative, and cultural configuration" (Pablo 1994: p.806)

Most of the literature based on the Finance and Economics and Strategy schools of thought presents contradictory results regarding the realization of potential in post-

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[1] The original four schools identified by Haspeslagh and Jemison (1991) were: 1. Finance and Economics; 2. Strategy; 3. Organization theory; and 4. Process perspective. At the recommendation of the dissertation committee, we changed the names of the last two schools of thought into Organizational Structures and Integration Design respectively. By changing these two labels we avoided confusion caused by first, the all-encompassing concept of "Organization theory" and second, by the fact that Process school perspective on mergers and the Process model as a type of logical structure of a theoretical model are two different and unrelated concepts.

merger organizations (Larsson and Finkelstein 1999). As these two perspectives have not been able to explain these outcomes, scholars adopting Organizational Structures or Integration Design perspectives have begun to focus on: 1) post-merger organizational integration (e.g. Larsson and Lubatkin 2001; Schweiger and Denisi 1991; Riad 2005); or on 2) factors influencing the management of the integration process (e.g. Larsson and Finkelstein 1999; Vaara 2002; Birkinshaw et al.2000; Greenwood et al. 1994). These studies advance the idea that the creation of potential synergies relies on the effective management of the post-merger integration process (Greenwood et al. 1994). Considering this, we chose to focus only on the latter two schools when identifying studies on PMI issues.

Both the Organizational Structures and the Integration Design schools emphasize the concept of *differences* throughout all merger stages. Paying attention to the eventual strategic and organizational differences in the early stages of the integration process is considered crucial for the successful management of the post-merger integration process (Jemison and Sitkin1986). This means that a pre-merger analysis of strategic relatedness and organizational compatibility indicates only the potential for value creation and anticipated difficulties in implementation (Haspeslagh and Jemison 1991). The realization of this value-creation potential and the avoidance of severe difficulties during the PMI phase depend on how the PMI process is approached and managed (Birkinshaw et al. 2000).

In PMI settings, IT integration represents a process of change that comprises: "changes in IS strategy, IS structure, and in systems supporting the combined IS and business units that allow them to function as a whole" (Mehta and Hirschheim 2007: p.145). IS scholars have found that early assessment of the IT "fit", representing the match or lack of differences between the IT configurations of the merged organizations, is key to successful post-merger integration (Buck-Lew et al. 1992; Johnston and Yetton 1996).

In a similar vein, the professional literature also emphasizes the importance of IT integration during the post-merger phase (Boston Consulting Group 2004). A survey of 334 senior business and IT executives involved in mergers found that IT integration was cited as the most critical factor for merger success (Curtis and Chanmugam 2005). A common barrier to successful mergers has been found to be the incompatibility of

the information systems of the merging parties, which makes the integration task extremely challenging. For instance, when Coty, a world leader in cosmetics, decided in 2005 to merge with Unilever Cosmetics International it was assumed that the integration of the two firms' supply chain systems would be a "brainless" process that would take no longer than 6 months (Worthen 2007). However, a few months after the merger was announced the new CIO realized that the two IT-based order-entry, financial and shipping systems were incompatible. The company decided that a service-oriented architecture (SOA) middleware solution was necessary to span the boundaries of the previously separate organizations and make the two different IT functions talk to each other, while a common ERP system was to be developed over the next few years. In another consultancy report, the Boston Consulting Group (2004) argues that insufficient attention to IT in mergers may result in a merged entity whose IT function amounts to a patchwork of applications that can't communicate, except for a few improvised links that have been set up to overcome specific operational constraints.

These examples, culled from the IS practitioner literature from the last 10 years, reveal a lack of understanding of whether some of the difficulties in post-merger integration are linked to poor pre-merger IS planning or to post-merger IS development initiatives that fail to deliver the expected benefits.

This motivated our review of the academic literature on PMI integration in order to evaluate what we know and what we do not know on the role of IS/IT in this context.

2.1 Post-Merger Integration: Managing the Differences − A Literature Review

We conducted a two-phase literature review that covered the past 20 years. First, we searched the strategic management and organization literatures for articles that focused on the post-merger integration phase (Organizational Structures and Integration Design perspectives), and we cross-examined the articles in order to identify studies that included IT/IS integration elements. Second, we identified, in the IS literature, articles on post-merger IT integration[2].

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[2] For a detailed analysis of the IS literature on post-merger IS/IT integration and the methodology used for the literature review see Vieru and Rivard's (2007) paper in Appendix E.

We used two main sources: 1. Databases: ABI/INFORM and Science Direct with emphasis on: a) scholarly journals such as, *Academy of Management Journal, Academy of Management Review, Strategic Management Journal, Organization Studies, Long Range Planning, Strategic Change, Information & Management, European Journal of IS, Journal of IT, JAIS,* and *Journal of Strategic Information Systems* that cover strategic and organizational issues; and b) the top 5 IS journals according to the MIS journal rankings provided by AISWorld Net (Saunders n.d.) namely: *MIS Quarterly, Information Systems Research, Communications of the ACM, Management Science,* and *Journal of MIS*; 2) The "ancestry" technique of article identification (cf. Cooper 1998) which implies reviewing citations from the articles previously identified. Accounting, Auditing & Accountability journal and the proceedings of *HICSS, ECIS* and *AMCIS* were then included. We excluded articles from the practitioner-oriented literature (e.g. *McKinsey Quarterly, Mergers & Acquisitions*, etc.) and concentrated on articles that present either methodological-based empirical studies or theoretical papers. It should also be noted that we didn't consider work published in monographs, in IT consultancy literature (e.g. Accenture, Gartner), nor in specialized conferences (e.g. the Post Merger Integration Conference). Despite these limits, we reckon that the variety and quality of the publications included in our review provide an adequate sample on the existing research on post-merger integration.

The search yielded 88 articles, published in 38 journals and three conference proceedings, 21 of which focused on IS/IT integration. Table I presents a synthesis of the sources for the literature review. We used a concept-centric approach to evaluate each article along two dimensions: the school of thought to which it belonged (based on Haspeslagh and Jemison's (1991) typology and its logical structure[3]. A content analysis helped us identify common concepts as well as each article's theoretical perspective. We based our analysis on Krippendorff's (2004) framework that defines content analysis as "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use" (Krippendorff 2004: p. 18). Appendices A to D synthesize the results of the literature review.

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[3] The logical structure of a theoretical development "refers to the time span of theory […] and to the hypothesized relationships between antecedents and outcomes" (Markus and Robey 1988, p.584). There exist two types of logical structure: variance models and process models. Variance models hypothesize linear associations between predictors and outcomes, whereas process models explain how outcomes of interest develop through a sequence of events (Mohr 1982).

Table I Synthesis of the sources for the literature review on PMI Organizational Structures and Integration Design Schools

Journal	Field of Research			
	Organization Studies		Information Systems	
	Organizational Structures School (no. of articles)	Integration Design School (no. of articles)	Organizational Structures School (no. of articles)	Integration Design School (no. of articles)
Organization Studies	3	6		
Strategic Man. Journal	3	4		
Journal of Management Studies		5		
Information & Management				5
Academy of Man. Journal	2	3		
British Journal of Man.	2	2		
Long Range Planning	1	2		1
Human Relations	3	1		
Journal of Strategic IS				3
Organization Science		3		
Strategic Change	2	1		
Management Decision		2		
HICSS Conference				2
ECIS Conference			1	1
Journal of Org. Change Man.	1	1		
Journal of Management	1	1		
Healthcare Man. Review	2			
Management Science	1			
Adm. Sciences Quarterly		1		
Academy of Management Review		1		
MIS Quarterly				1
MIS Quarterly Executive				1
JAIS				1
Information Systems Journal				1
The DATA BASE for Advances in IS				1
AMCIS Conference				1
AA & Accountability Journal				1
Computers in Human Behavior			1	
Management		1		
Management Learning		1		
IEEE Transactions on Eng. Management		1		
Management International		1		
European Man. Journal		1		
Journal of European Ind. Training		1		
Human Resource Management	1			
Scandinavian Journal of Man.		1		
Career Development Intl.	1			
Journal of App. Behavioral Science		1		
British Journal of Social Psychology	1			
Journal of App. Social Psychology	1			
Intl. Review of Strategic Man.	1			

2.1.1 The Organizational Structures School

The researchers in this perspective (Appendix A) are preoccupied by three main topics: the management of structural and human resources differences; the management of cultural differences; and the management of differences in individual

reactions towards the merger. Some authors consider that emphasis should be put on integrating organizational cultures (Nahavandi and Malekzadeh 1988; Riad 2005), management practices (Datta 1991), and organizational structures (Lubatkin, Calori, Very et al. 1998). Others focus their attention on how to mitigate issues at the individual level such as stress, uncertainty (Schweiger and Denisi 1991), feelings of exclusion (Harwood and Ashleigh 2005) and lack of organizational identification (van Dick, Ullrich and Tissington 2006; Millward and Kyriakidou 2004).

IS Articles - Only three IS studies were found that adopted this perspective. Their authors analyzed the IS human resources integration challenges. Factors such as individuals' acceptance of new IT (Huang and Chuang 2007), incentive mechanisms, career uncertainty, autonomy removal (Alaranta and Viljanen 2004), or cultural differences (Weber and Pliskin 1996) have been empirically found to have an impact on the outcomes of the process of IT integration.

In general, the Organizational Structures perspective suggests that if management fails to take the above aspects into consideration, the post-merger integration process risks facing problems such as cultural clashes (Nahavandi and Malekzadeh 1988; Larsson and Lubatkin 2001; Weber and Pliskin 1996), resistance to change (Haunschild, Moreland and Murrell et al. 1994), and high employee turnover (Lubatkin, Schweiger and Weber 1999; Hambrick and Cannella1993) including the loss of highly-skilled IT staff (Alaranta and Viljanen 2004). Central to the Organizational Structures perspective on PMI is the assumption that integration problems are possible to predict and avoid by means of careful attention to differences in the planning phase.

2.1.2 The Integration Design School

The Integration Design perspective (Appendix C) suggests that the realization of the potential synergies depends on how the post-merger integration process is managed (Birkinshaw et al. 2000). This line of work presents four main streams of research: the management of differences during the PMI; the decisional process in PMI; organizational learning in the PMI context; and the roles of professionals during the PMI.

The first stream emphasizes the importance of the management of differences during the integration process. Here, scholars propose contingency integration frameworks that aim to enhance our understanding of how emerging post-merger differences such as, changes in management practices (Greenwood et al. 1994; Chakrabarti 1990; Napier 1988), employee resistance (Larsson and Finkelstein 1999), contextual knowledge (Ranft and Lord, 2002; Schweizer 2005), perceived cultural differences (Calori, Lubatkin and Very 1996; Norburn and Schoenberg 1994), or changing external corporate environments (Papadakis 2005) are dealt with by using different ways of managing them.

The researchers in the second stream are interested in how decisions are made during the pre-merger process of integration design and during the management of the emerging post-merger differences. The authors of these studies suggest that decisional factors like political power (Calori et al. 1996; Pablo 1994), institutional arguments (Comtois et al. 2004), decisional legitimacy (Kitchener, 2002), emergent conflicts (Yu, Engleman, and Van de Ven 2005), decisional risk propensity (Pablo, Sitkin and Jemison 1996), or retention of the old organizational identity (Olie 1994) affect how managers make integration-related decisions and explain why they often alter the course of action of the integration process.

In the third stream, researchers, drawing on organizational learning theory, are interested in analyzing the relationship between prior merger experience and the merger performance (Hayward 2002; Hebert et al. 2005), or in studying emergent post-merger processes of individual learning that are considered as being necessary for effective knowledge sharing and collaboration (Villinger 1996; Leroy and Romanantsoa 1997).

Finally, in the fourth stream of research, scholars are interested by the effect of the evolving roles of professionals during the post-merger period on the outcomes of the integration process. Some authors found that the way in which differences are managed is likely to affect the way employees make a decision on whether to leave the company, resist the merger (Meyer 2006; Ranft and Lord 2002; Empson 2001), or adopt a supportive role during the merger (Balogun, Gleadle, Hailey et al. 2005; Vaara 2001). Others observed that collective leadership, in which members play

complementary roles (Denis et al. 2001), or assume cross-organizational responsibilities (Graebner 2004) may be necessary for achieving merger goals.

IS Articles – Eighteen articles were found that adopted the Integration Design perspective (Appendix D). These articles are characterized by three lines of work: to propose IT integration strategies that will align the IT function with the business goals that emerge from the planned post-merger integration approaches; to identify/measure IT integration success factors; and to analyze the process of integration decision-making

In the first line of work, a number of articles advance contingency frameworks that propose different degrees of IT integration according to: IS requirements, business objectives and merger goal (Giacomazzi et al. 1997); type of IS governance (Brown and Renwick 1996); level of strategic importance of the IS function, lines of communication, organizational IS learning (Merali and McKiernan 1993); "fit" within and between the IT configurations of the merged entities (Johnston and Yetton 1996); or IT-business alignment requirements (Wijnhoven et al. 2006; Mehta and Hirschheim 2007; Alaranta and Henningsson 2007; Yoo et al. 2007).

In the second line of work, factors, such as IS participation in merger planning, level of IS standardization, programming language incompatibilities (Stylianou, Jeffries and Robbins 1996; Robbins and Stylianou 1999), IS personnel retention (Hwang 2004), resistance to change, cultural readiness, and learning capacity (Alaranta 2005) have been empirically found to have an impact on the results of the process of IT integration.

Finally, in the last line of work, researchers analyze the process of integration decision-making by providing process models that enhance our understanding of the relationships between design decisions, implementation activities and IT integration outcomes (Mehta and Hirschheim 2004; Granlund 2003).

Discussion - According to our literature review, the two schools of thought approach the topic of how to successfully attain the potential post-merger synergies differently. On one hand, according to the Organizational Structures perspective on PMI, the success of a merger is dependent on the careful planning of new and integrated

structures and processes (Larsson and Finkelstein 1999). At the core of this perspective on PMI is the assumption that integration problems can be predicted before the process of PMI begins. On the other hand, the Integration Design school, contrary to the Organizational Structures school, questions management's ability to anticipate differences that may impede the post-merger organizational compatibility, such as cultural and management practices. During the pre-merger planning phase, managers usually put more emphasis on the strategic differences and less on identifying the organizational differences due to the historical importance that is given to the strategic part of the deal (Greenwood et al. 1994). It has been suggested that greater attention should be given to emerging processes when studying diverse issues in the post-merger phase (Empson 2001; Greenwood et al. 1994).

Thus, according to the Integration Design perspective, post-merger management of organizational differences should focus mainly on the "challenge of balancing integration and autonomy" (Graebner 2004: p.751), or what Haspeslagh and Jemison (1991) have called, "the issue of boundary management" (p.142). This reflects a dilemma of how much integration of and how much autonomy among the merging parties is needed to achieve potential synergies. Due to the fact that in this thesis we are interested by this dilemma, we will focus only on the Integration Design school view of PMI.

Our literature review regarding IS research on PMI identified two salient issues. First, most of the IS studies on PMI describe the relationship between IT integration and business integration by following the traditional deterministic IT research agenda, that is, "to understand the consequences of information technology (whether models, techniques, or devices), given specific objectives" (Orlikowski and Barley 2001: p.146). Second, despite the emphasis on the management of differences, studies on PMI don't mention if there is also a dilemma of integration versus autonomy at the IT function level. While IS researchers agree that differences in post-merger IT functions need to be dealt with (Buck-Lew et al. 1992; Johnston and Yetton 1996), we find that IS studies in PMI settings focus mainly on the processes of change in IS strategy and IS structure and do not address this potential dilemma. The practitioner literature, however, suggests that there is a dilemma of integration versus autonomy of the IT function.

Thus, to understand "the issue of boundary management" in the context of IT integration, we need to investigate how the literature on PMI has addressed the dilemma of integration vs. autonomy.

2.2 Dilemma of Integration versus Autonomy

Researchers have addressed the post-merger "issue of boundary management" by proposing integration approaches that they deem appropriate given some of the merging parties' strategic and organizational characteristics (Ranft and Lord 2002; Schweizer 2005). The Integration Design perspective on PMI considers that the choice of integration approach is one of the most important strategic decisions to make in mergers (Pablo 1994; Zollo and Singh 2004). A number of researchers have proposed various typologies of integration approaches based on strategic and organizational dimensions (e.g. Haspeslagh and Jemison1991; Nahavandi and Malekzadeh1988; Marks and Mirvis 2001). These works, based on case studies of selected mergers, provide prescriptive viewpoints of the effectiveness of the management of different integration approaches (Ellis 2004).

2.2.1 Post-merger Integration Approaches within the Integration Design Perspective

Adopting a cultural-based view, Nahavandi and Malekzadeh (1988) proposed an acculturation model that describes four approaches to PMI: separation, assimilation, integration, and deculturation. In their view, the process of post-merger acculturation "addresses the different ways through which the culture […] of two companies can be combined" (p.83) and its outcomes reflect the tension between the forces of organizational integration and the forces of cultural differentiation. The model is based on two dimensions: *degree of relatedness* between the companies involved in the merger and the *degree of tolerance for multiculturalism* by the merger decision-makers. The degree of relatedness reflects the extent of the "closeness" amongst the merging firms in terms of products, customers, and resources.

In another study, Haspeslagh and Jemison (1991) developed a capability-based framework that identified four integration approaches (preservation, holding, symbiosis

and absorption) by combining two dimensions of the PMI process, the *need for strategic interdependence* and the *need for organizational autonomy*. The authors posit that the more the merging organizations exhibit complementarity of capabilities, the more they need to create and manage interdependences. However, while "capability transfer requires different degrees of boundary disruption or dissolution, the preservation of capabilities requires boundary protection and, hence, organizational autonomy" (Haspeslagh and Jemison 1991: p.142); thus, the emergence of the dilemma of integration versus autonomy. On one hand, the *need* for strategic interdependence reflects the relationship between the degree to which the boundaries between the merging parties' organizations will have to be altered or eliminated and the nature of the resources or capabilities that will be shared. On the other hand, the *need* for organizational autonomy focuses on to what extent the preservation of resources and capabilities requires the protection of the old organizational boundaries.

Therefore, Haspeslagh and Jemison (1991) argue that, in order to preserve capabilities in post-merger settings, a certain degree of organizational autonomy should be allowed especially where capabilities are "inseparable from the culture in which they are rooted" (p.144).

Finally, Marks and Mirvis (2001) identified four main integration approaches, absorption/reverse takeover, preservation, best of both, and transformation by using a two-dimensional framework based on the various *degrees of post-merger change* in the merging firms, as the basis for their typology scheme.

In a recent synthesis of the different typologies of post-merger integration approaches, Ellis (2004) argues that despite the fact that Nahavandi and Malekzadeh (1988) and Marks and Mirvis (2001) employ different theoretical perspectives, the resulting integration approaches are quite similar to those identified by Haspeslagh and Jemison (1991) who drew on a capability-based perspective.
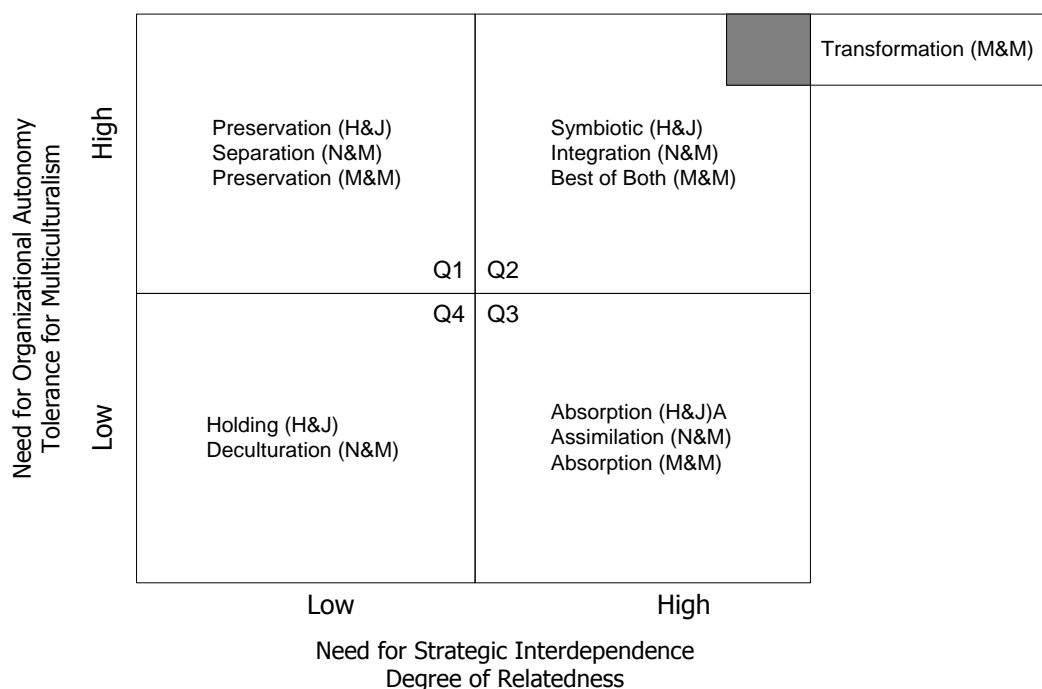
Figure 1 PMI Approaches[4] **(Ellis 2004)**

Figure 1, taken from Ellis (2004: p.116), illustrates the similarities among the integration approaches identified in the three works. The dimensions along the X-axis, *need for strategic interdependence* (Haspeslagh and Jemison 1991) and *degree of relatedness* (Nahavandi and Malekzadeh 1988) illustrate the extent to which the two firms involved in the merger augment or complement each other in terms of products and customers.

A high level of relatedness between firms will result in a higher degree of need for strategic interdependence between the merging firms (Haspeslagh and Jemison 1991) which will engender various degrees of post-merger change in one or both merging firms (Marks and Mirvis 2001). On the Y-axis, the *need for organizational autonomy* can be defined as the degree of cross-boundary interaction and coordination between the merging firms (Haspeslagh and Jemison 1991; Larsson and Finkelstein 1999), and *tolerance for multiculturalism* as the extent of the tolerance of the new organization to maintain elements of culture (Nahavandi and Malekzadeh 1988) and

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[4] The authors' initials are indicated beside each term they used in their work to describe a certain integration approach such as: H&J=Haspeslagh and Jemison (1991); N&M=Nahavandi and Malekzadeh (1988); M&M=Marks and Mirvis (2001).

structures (Marks and Mirvis 2001) that originally belonged to the firms involved in the merger.

According to these typologies, depending on their interdependence and organizational autonomy needs, firms that engage in mergers adopt an integration approach from one of the four quadrants presented in Figure 1 (Ellis 2004). The integration approach presented in quadrant 1 (Q1), usually labeled in literature as *preservation*, is deemed appropriate when there is a strategic need to maintain the sources of expected value-creation intact by preserving the boundary between the organizations. *Absorption* (Q3) occurs when one of the firms imposes its work practices, norms and culture on the other parties. It is deemed appropriate to contexts with a high level of relatedness and a low need for organizational autonomy[5]. When, as in Q2, there is a high need for interdependence but also a high need for organizational autonomy (or high tolerance for multiculturalism), a completely new organization should emerge from the merger. There exist two alternate approaches for creating this new organization: *symbiosis* and *transformation*.

In the *symbiotic* approach, the merging parties first coexist and then are gradually blended together by becoming increasingly interdependent (Ellis 2004). In this approach, Haspeslagh and Jemison (1991) posit that the firms "need simultaneous boundary preservation and boundary permeability" and in order to symbiotically integrate, "each firm must take on the original qualities of the other" (p.149). In the *transformation* approach, firms are integrated by developing totally new, yet common, practices, culture and other organizational attributes (Marks and Mirvis 2001).

Even though Ellis' (2004) matrix puts the two integration approaches in the same quadrant (Q2), they exhibit an important difference. According to Marks and Mirvis (2001), the difference between the symbiotic (they call it "best of both") and transformation approaches is characterized by the amount of change in organizational structures and culture that each merging company undergoes during the PMI. While the symbiotic approach involves a medium degree of change for all parties involved, the transformation approach entails fundamental changes for all the merging entities.

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[5] In their study, Marks and Mirvis (2001) analyze only acquisitions. They consider the process of integration as a power struggle between the acquirer and the acquired. In this vein, they identify two versions for quadrant 3: absorption (assimilation initiated by the acquirer) and reverse-takeover (assimilation initiated by the acquired).

Finally, *holding or deculturation* (Q4), illustrates idiosyncratic mergers where one or all merging entities are not interested in integration. The value creation is based only on risk-sharing and general management capability (Haspeslagh and Jemison 1991), and/or one of the organizations eventually ceases to exist as a cultural entity due to its lack of interest in its own culture, practices and organizational structures (Nahavandi and Malekzadeh 1988). Given the lack of empirical existence of such type of mergers (Haspeslagh and Jemison 1991) and more importantly, the absence of post-merger integration intention, we follow Ellis' (2004) recommendation and we will not take this approach into consideration here.

Thus, taking into consideration the clear delineation of the different strategic directions among the integration approaches advanced by each of the three typologies, four ideal integration approaches can be identified in the literature on PMI: *preservation*, *absorption*, *symbiotic*, and *transformation* (Ellis 2004). Figure 2 shows a simplified view of the four ideal PMI approaches that will further be used in this thesis.
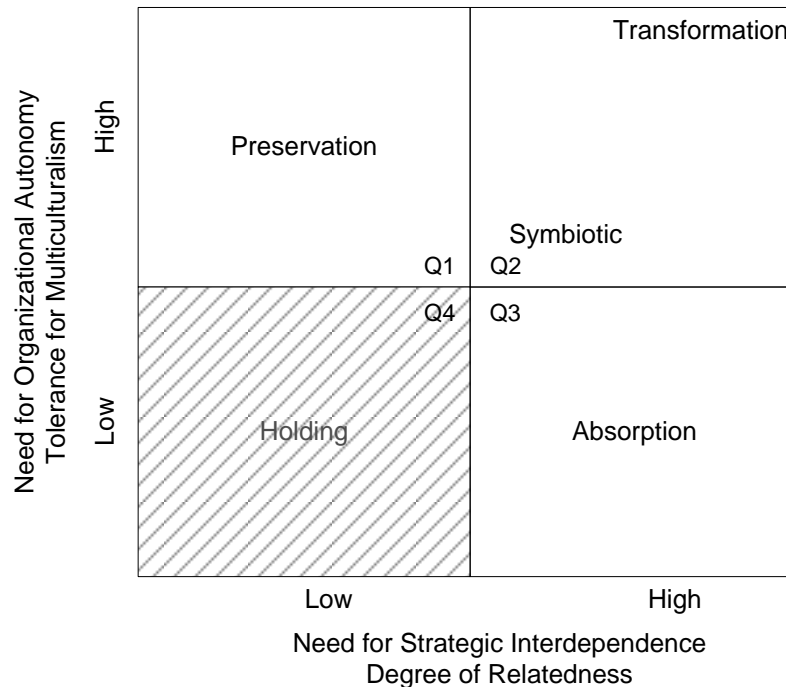
Figure 2   Four Ideal PMI Approaches

From Q2 and Q3 in Figure 2 it can be inferred that when for high degrees of relatedness and strategic interdependence need, the integration approach should either

be *absorption*, in the case of a low need for organizational autonomy, or *symbiotic or transformation*, in the case of a high need for organizational autonomy (Ellis 2004). Haspeslagh and Jemison (1991) argue that high interdependence levels combined with high autonomy level-based approaches are applicable in the case of organizations that need to deal with the challenge, on one hand, to maintain the pre-merger organizational boundaries in order to preserve existing capabilities and, on the other hand, to ensure efficient capabilities sharing by dissolving those boundaries.

The integration versus autonomy decision is also reflected by the question of whether maintaining a low strategic interdependence and some, or all structural, cultural and practice differences in the long term will represent the right approach for post-merger value creation (Q1). If the answer to this question is yes, meaning that there is a strategic need to maintain the sources of expected value-creation intact by preserving the boundary between the organizations, then decision-makers should choose a *preservation* strategy.

2.2.2 Implementation of PMI Approaches

While most of the extant empirical studies on the PMI process using the above integration approaches provide interesting insights into post-merger success factors, they tend to offer "either/or" type of solutions, that is, for one given pre-merger type of combination (degree of interdependence) there is only one type of integration approach (Ellis 2004). However, other researchers have observed that in some mergers, the combined organization will adopt multiple types of integration approaches (Schweizer 2005; Ranft and Lord 2002). These researchers posit that there is a need to go beyond single integration approaches. This viewpoint has recently been echoed by a few empirical studies that describe how, in a number of mergers, organizations involved in an merger, chose multiple approaches of integration based on intent for the merger (Bower 2001; Schweizer 2005) or type of shared resources or capabilities (Ranft and Lord 2002; Graebner 2004; Yoo et al. 2007).

For instance, in a study of a merger between a pharmaceutical firm and a biotechnology firm, Schweizer (2005) found that the merging organizations chose to apply different integration approaches to some of their business processes. The author identifies two different approaches (*preservation* and *absorption*), implemented at

different paces (slow and fast) but simultaneously, to integrate competencies from both merging companies in order to accomplish the short- and long-term motives for the merger. On one hand, the general biotech non-R&D knowledge and business processes were rapidly absorbed by the pharmaceutical firm in order to strengthen its market position. On the other hand, decision-makers realized that in order to keep its value for the merger, specific biotech R&D knowledge needs to retain its contextuality; therefore, total organizational autonomy for the biotech R&D department was granted. According to Schweizer (2005), the preservation approach was dictated by the need for long-term availability and development of the existing biotech core competencies based on the knowledge embedded in the shared practices of the members of the R&D group. This dual integration approach, is labeled as *hybrid* by Schweizer (2005), and its main difference with Haspeslagh and Jemison's (1991) *symbiotic* approach is that in the former, two different approaches are implemented at the same time, whereas in the latter, the members of the merging entities go through an initial phase of preservation followed by a slow and gradual integration.

In another study, Ranft and Lord (2002) propose a model of knowledge sharing during PMI implementation. Basing themselves on the in-depth study of seven cases of high-technology mergers, the authors developed a set of propositions regarding the influence of the nature of the knowledge to be shared on the PMI approaches. They also try to solve the "issue of boundary management" represented, in their case, by the trade-off between the need to preserve valuable knowledge situated within the boundaries of each of the former independent organizations and the need to share it across these boundaries. In their empirical study found that, despite recommendations in the literature for either preservation or absorption approaches in the case of mergers motivated by the potential acquisition of knowledge-based resources, successful PMIs were the result of a mix of simultaneously applied approaches of preservation (high degree of organizational autonomy in terms of structure, culture and organizational values) and symbiosis (high degree of interdependence between individuals that were collaborating across the post-merger organizational boundaries). The intense communication between the members of the merging entities helped different professional communities establish a favorable environment for cooperation and

collaboration. This environment was found to be conducive to enhancing the exchange of tacit and socially complex knowledge and enabling organizational learning.

This line of research emphasizes the fact that PMI is a complex and delicate process that cannot be fully understood by only considering single integration approaches in isolation and promotes three main ideas. First, considering the actual high failure rate of mergers, decision-makers may find it necessary to combine "different approaches into one integration process, depending on the motives, the industry sector and company characteristics, and the functions/stages of the "value chain" (categories of value-adding activities of an organization) to be integrated" (Schweizer 2005: p.1052). Second, the "issue of boundary management" should be dealt with by simultaneously providing multi-level, different integration approaches that would ensure, on one hand, a certain degree of organizational autonomy for some business units, and on the other hand, an environment that enables, if necessary, sharing work practices and knowledge for other business units (Ranft and Lord 2002; Schweizer 2005). Third, boundaries to be managed are defined not only in terms of differences in organizational structures, but also associated with differences in knowledge bases, information systems (Yoo et al. 2007) and work practices (Ranft and Lord 2002; Schweizer 2005).

The Integration Design perspective on PMI agrees with the fact that value creation results from an organization's ability to share and integrate knowledge assets across the previous organizational boundaries (Greenberg and Guinan 2004; Hebert et al. 2005). However, this line of work argues that too much integration may render some of this knowledge useless due to its contextual nature (Graebner 2004). The PMI phase creates a context in which organizations that were once independent need to overcome their idiosyncrasies in terms of knowledge embedded in routines and best practices if they want to share knowledge-based resources (Leroy and Romanantsoa 1997; Villinger 1996)

Further, we explore the main tenets of the literature on boundary-spanning knowledge sharing and then link their relevance to the process of IS development and the PMI context.

2.3 Perspectives on Boundary-spanning Knowledge Sharing

With the intensification of competition and the development of various forms of distributed and virtual modes of work, scholars have increasingly regarded an organization's ability to facilitate the sharing of knowledge as being critical for organizational effectiveness (Kogut and Zander 1996; Nonaka and Takeuchi 1995; Tsai 2001). Indeed, in the literature on ISD there is an agreement that one of the main reasons for the failure of some ISs to deliver the expected benefits is related to the lack of effective knowledge sharing among team members during the development and implementation of such technologies (Davidson 2002).

In the literature on knowledge sharing there is agreement that in order to assess the perspectives on knowledge sharing we need a basic conceptualization of the concept of knowledge (Davenport and Prusak 1998). The common view in Organization and IS literatures on knowledge invokes a triple hierarchy of data, information, and knowledge, which considers data as an ordered sequence of basic facts and events, information as data interpreted and given meaning, and knowledge as information possessed in the mind of individuals resulting from the judgment of the significance of organizational events in a specific context (Alavi and Leidner 2001).

Another definition is provided by Davenport and Prusak (1998: p.5): "Knowledge is a flux mix of framed experiences, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of 'knowers'. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms."

While this definition emphasizes the dynamic character of knowledge, it doesn't offer a clear delineation between information and knowledge, nor does it explain how the contextual information originates in the minds of individuals. Also, while knowledge is considered as being embedded in organizational structures, it is not revealed how individuals share it within and across organizational boundaries. Thus, we turned to the literature on knowledge sharing to try to understand how scholars have approached this topic.

Table II Alternative Perspectives on Boundary-spanning Knowledge Sharing in Organizations

	Main Perspectives		
	Knowledge-as-Possession		Knowledge-in-Practice
	"Reification" approach	"Subjectivist" approach	
Epistemological Assumptions	*Knowledge* is an object to be stored and manipulated (Alavi and Leidner 2001) Knowledge is an important asset and in order to remain competitive, organizations must efficiently and effectively create, locate, capture, and share knowledge in order to apply that knowledge to solve problems and exploit opportunities (Zack 1999)	*Knowledge* is a flux of framed experiences, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information (Davenport and Prusak 1998: p.5)	Knowledge is "localized, embedded and invested in practice" (Carlile 2002: p.442) and encompasses two complementary epistemologies: *Knowledge* as possession and *knowing* as action Knowledge and practices are reciprocally constitutive;
Purpose of Research	To identify valuable knowledge and develop effective mechanisms based on common syntax and standards for inter-organizational transfer of that knowledge.	To understand how knowledge is created, articulated, disseminated and legitimized within communities of practice and organizations To identify mechanisms to share knowledge across communal and organizational boundaries	To understand how knowledge, considered integral part of practice, is created, articulated, disseminated and legitimized within organizations by assessing its complexity at the boundaries between fields of practice. To identify mechanisms to share practices across fields of practice
Theoretical Foundations	Information processing theory, Knowledge- and Resource-based views of the firm, Contingency theories	Sensemaking, Social representations theory, Communities of practice	Practice perspective, Structuration perspective
Knowledge Sharing Enablers	Codify tacit knowledge; Implement efficient coordination mechanisms; Promoting trust and provide incentives to individuals that will entice them to share knowledge	Boundary objects; Boundary spanners - effectively negotiate the differences in meaning and interests of the various communities of practice	Boundary objects; Boundary spanners – effectively negotiate differences in meaning and interests of the agents from different fields of practice.
Levels of Analysis	Individual and Group	Individual and Group (communal)	Group (field of practice)

The literature on organizational knowledge sharing across boundaries is based on two main perspectives for conceptualizing knowledge:

1) The *Knowledge-as-possession* perspective in which knowledge is considered as being possessed by individuals and/or groups and defines knowledge as either an object that can be manipulated, or as a disposition embedded in the minds of individuals and the social networks within communities of practice (Orlikowski 2002).

2) The *Knowledge-in-practice* perspective in which knowledge is "localized, embedded and invested in practice" (Carlile 2002: p.442) and encompasses two complementary epistemologies: *knowledge* as possession and *knowing* as action (Cook and Brown 1999). Table II summarizes these two perspectives.

2.3.1 The Knowledge-as-Possession perspective

This perspective presents two different discourses on the nature of knowledge. The first one uses a *reification* approach that treats knowledge as a thing (Orlikowski 2002). To reify is to "thingify": to treat an abstraction as a material thing. This approach advances the idea that individual knowledge should be considered as being an object and consequently has an explicit component (or *know-that* - knowledge that can be formalized and stored in documents and digital information systems) and a tacit component (knowledge associated with the concept of *know how* or skills that cannot be easily structured and stored).

The second discourse is based on a *subjectivist* approach that uses cognitive interpretations of knowledge in which it is considered as being an individual and/or collective disposition (Orlikowski 2002) and embedded in the social relationships found within work groups or communities of practice (Brown and Duguid 1991; Boland and Tenkasi 1995). Communities of practice are usually defined as occupational-based groups of individuals that share work practices that reflect common organizational norms and understandings (Bechky 2003) and a unique knowledge domain (Wenger 1998).

The Reification approach – In this line of research the process of knowledge sharing is compared with the mechanical notion of "knowledge transfer" (Bechky 2003) due to

the fact that knowledge is considered as being a transferable object. The proponents of this approach focus on the issue of how to translate tacit knowledge into explicit knowledge (e.g. Nonaka and Takeuchi 1995; Szulanski 1996). Drawing on the resource-based theory of the firm, a number of researchers conceptualize knowledge as "core competencies" or "core capabilities" (e.g. Prahalad and Hamel 1990; Spender and Grant 1996). Knowledge is considered as being "synonymous with information created, disseminated and embedded in products, services and systems" (Gherardi 2000; p.213), therefore capable of being codified, stored, and transferred between people and across organizational boundaries. The key managerial challenges here are how to effectively convert tacit knowledge into explicit knowledge (Szulanski 1996) and then transfer it across static and well defined organizational boundaries (Cummings 2004; Carlile 2004). This approach to knowledge sharing is based on the information processing theory (Lawrence and Lorsch 1967) that considers knowledge as being a transferable object.

In their seminal work, Lawrence and Lorsch (1967) observed that the idiosyncrasies of the environment and organizational structures were associated with differences in the cognitive orientations of managers in the organizational business units. The mechanisms for inter-unit collaboration proposed by Lawrence and Lorsch that would enable the "knowing of what others know" were predominantly structural in nature (liaisons, project teams, etc.). They were rational devices for enhancing interdepartmental communication based on better management of the channels of communication, and that generally overlooked the problem of human meaning and interpretation.

The main assumption of the information processing theory is that communication is a process of message sending and message receiving through a transmission channel with limited channel capacity. Information and data are considered as conveying *objective* knowledge and as having fixed meanings. Organizational members are able to share each other's knowledge due to the fact that the fixed meanings of words can be communicated objectively from one person to another.

The proponents of this perspective have identified two managerial challenges related to the process of knowledge sharing across boundaries. The first challenge

relates to how to create appropriate channels for transmitting information – In this line of work, Daft and Lengel's (1984) media richness theory advances different types of information channels (written formal, telephone and face-to-face) as increasingly complex structures to match the complexity of the information to be processed. Therefore, as long as information is made available, shared understandings are achieved without problem if all organizational members use a common lexicon to gain meaning from the data (Carlile 2002).

The second challenge is the issue of knowledge "transferability" across boundaries – The challenge is to identify and implement coordination mechanisms that reflect the level of knowledge "complexity" in terms of level of codification (explicit versus tacit) (Grant 1996). The more codified (explicit) and less dependent on its context the knowledge is, the less complex it is considered to be. Complex knowledge is considered less transferable across intra-organizational boundaries. Therefore, the level of complexity will influence what type of coordination mechanisms will be used. Formal, vertical coordination mechanisms will be appropriate for highly codified knowledge but will not be efficient in the case of tacit knowledge where lateral coordination mechanisms such as team cooperation and mutual adjustment are recommended. The coordination mechanisms include organizational members called "boundary spanners" (Irwin and More 1991) or "information gatekeepers" (Katz and Allen 1985) that integrate differential knowledge by collecting and converting information from various departments and dispersing it across the organization.

While advancing a practical approach by describing the necessary processes that need to be initiated to efficiently share organizational knowledge, the reification approach has limitations. First, this approach, suffers from what Tsoukas and Mylonopoulos (2004) call the "apple-tree fallacy: the knowledge individuals make use of in their work is considered to be a collection of freestanding items waiting out there to be plucked from the tree of organizational knowledge" (p. S4). Second, by assuming that a common lexicon is sufficient to share knowledge, this approach proves to be problematic in the context of collaborative efforts amongst different occupational communities within the same organization that have different understandings of work practices and organizational structures (Boland and Tenkasi 1995; Bechky 2003). This approach is not capable of dealing with the creation and the sharing of new knowledge

that doesn't use the already established common syntax. In this context, the problem of knowledge sharing shifts from being just a problem of effective coordination to being a problem of understanding the organizational arrangements and the nature of the new knowledge (Carlile 2004).

The Subjectivist approach – A number of organization scholars argue that prior research on knowledge, that used information processing approaches, stopped short of going beyond explanations that consider knowledge as being a well-defined object within an organizational context that can be taken for granted (Brown and Duguid 2001). These authors are critical of the reification approach that considers knowledge as being "made up of discrete beans which may be grounded, lost or reconstituted" (Tsoukas 1996: p.14). This line of research conceptualizes knowledge as "multi-faceted and complex, being both situated and abstract, implicit and explicit, distributed and individual" (Blackler 1995: p.1032). This approach departs from the idea that knowledge can be reified as a concrete and static property. Instead, it advances the idea that in order to understand how knowledge is created, articulated, disseminated and legitimized within organizations, knowledge should be considered as being a stable individual or group *disposition* embedded in organizational structures and in the social relationships evolving amongst the members of the same community of practice (Orlikowski 2002).

Two different views on the nature of the relationship between tacit and implicit knowledge characterize the subjectivist approach: an *integrated view* and a *distinctive view*. Some scholars have proposed an *integrated view* that advances the idea that organizational knowledge is emergent and processual and that the tacit and explicit parts of knowledge are mutually constituted (Tsoukas 1996; Boland and Tenkasi 1995; Weick and Roberts 1993; Cohen and Bacdayan 1994; Vaast, Boland, Davidson et al. 2006). In this perspective, it is suggested that knowledge is distributed across the organization and is "inherently indeterminate and continually emergent" in the sense that individuals do not know "in advance what that knowledge is or need be" (Tsoukas 1996: p.22). Over time, organizational members create a "procedural memory" (Cohen and Bacdayan 1994) or a "pattern of communication" within the "cognitive system" of a group (Hutchins 1991: p.2) as a means of appropriation of the knowledge embedded in

organizational routines. From a Social Representations view, Vaast et al. (2006) advance the idea that knowledge is "ephemeral, constantly shifting and contextually bound" (p.21) and relies on how members of different professional communities make sense of the social world. The distributed and emergent nature of knowledge is also reflected by Weick and Roberts' (1993) concept of "collective mind". The authors argue that knowledge as a "collective mind" represents the emergent outcome of "heedfully" interrelated individual contributions over time. Being an emergent phenomenon, the collective mind is not known in its wholeness by its members, but only partially in a differential manner to all.

In the *distinctive view*, scholars like Brown and Duguid (1998) and Garud (1997), while sharing the view of knowledge as being emergent and situated, propose to retain a distinction between types of knowledge. They posit that tacit knowledge (*know-how)* is different from explicit knowledge (*know-what*). The former is "the particular ability to put know-what into practice" (Brown and Duguid 1998: p.91). In regard to this view of knowledge, Cook and Brown (1999), identify four distinctive forms of knowledge, based on the group/individual and explicit/tacit distinctions: concepts, stories, skills, and genres. *Concepts* represent knowledge that an individual can learn and articulate explicitly such as rules and work standards. *Stories* are typically used as an explicit way for professional communities to utter collective memories of successes or failures. *Skills* reflect individual know-how. *Genres* illustrate the collective know-how embedded into the communities' practice. The authors emphasize the fact that one form of knowledge cannot be "converted" into other one during the process of knowledge acquisition, because "tacit knowledge cannot be turned into explicit, nor can explicit knowledge be turned into tacit" (p.385).

In addition, other researchers have identified other types of knowledge, such as *know-why* and *know-who* that, they argue, supplement and better explain know-how and know-that, making them easier to share (Johnson, Lorenz and Lundvall 2002; Garud 1997). *Know-why* provides the understanding of the rationale for the different norms and practices, and the meanings that legitimize their application within the local organizational or professional community culture (Boland and Tenkasi 1995; Garud 1997). The other category of knowledge, know-who or *who-knows-what* (Davenport and Prusak 1998) is critical for successful knowledge sharing and collaboration when

knowledge is distributed across multiple organizational groups or professional communities. Having access to *who-knows-what*, a group or an individual will be able to locate useful sources of tacit and explicit knowledge when faced with a new problem or opportunity (Cross, Parker, Prusak et al. 2001). It also reflects one's social ability to collaborate with others within the group or with other members of different groups (Johnson et al. 2002).

Table III Taxonomy of the Categories of Knowledge-as-Possession

Types of Knowledge	Knowledge Distinctions (Explicit vs. Tacit)	Forms of Knowledge (adapted from Cook and Brown 1999)	Approach (Reification vs. Subjectivist)
Know-what	Individual explicit knowledge concerning organizational norms and standards; can be stored in documents and digital information systems	*Concepts* – individual explicit knowledge	*Reification* – transformation of implicit into explicit knowledge should be the aim of any knowledge sharing initiative *Subjective* – know-how is not considered knowledge but just information
Know-how	Individual tacit knowledge representing internal accumulated knowledge that is called expertise or professional competence	*Skills* – capacity of being able to make proper use of concepts, rules and definitions and communicate tacit knowledge through shared practice	*Reification* – exists in the individuals' heads and can be changed into explicit knowledge *Subjective* – exists only in the individuals' heads and can't be changed into explicit knowledge
	Group tacit knowledge possessed by groups	*Genres* - collective shared conventions or know-how embedded into the professional communities' practice	These forms are only identified by the *subjective* approach as part of the "collective mind" or "organizational memory"
Know-why	Explicit knowledge relating to the rationale for the different exiting organizational norms and practices, and the meanings that legitimize their application	*Stories* – explicit means for professional communities to store and transmit collective memory of success or failure	
Who-knows-what	Explicit knowledge of tacit and explicit sources of knowledge within social networks, that may be local or global	*Stories* – explicit claims of expertise or use of metaphors that have a useful meaning within a specific group	

A taxonomy of the categories of knowledge is synthesized from the above discussion and illustrated in Table III. It extends Cook and Brown's (1999) framework by including the other two categories of knowledge, *know-why* and *who-knows-what*.

In the Subjectivist approach*,* sharing knowledge among people who are members of different organizational units, groups or communities of practice is difficult, since different communities usually do not share the same sets of values, ideas, and

interests. This makes tacit knowledge easily moved or "leaky" within communities based on similar professions, but "sticky" or difficult to be shared across different communities of practice (Brown and Duguid 2001; Bechky 2003). Sustained intra-community collaboration leads to *boundaries* that are based on shared histories of learning (Wenger, 1998), distinctions between old-timers and newcomers inside these groups, and on differences between networks of practice that can span multiple organizations (Brown and Duguid 2001). Domain-oriented knowledge bases allow for efficient communication *within* the community at the expense of making communication and understanding difficult for outsiders.

In these circumstances, knowledge sharing is facilitated by the use of various mechanisms for crossing boundaries, such as *shared stories* (Orr 1990; Boland and Tenkasi 1995), *common ground* (Bechky 2003) or *trading zone* (Kellogg, Orlikowski and Yates 2006), that have been described as being effective means for sharing knowledge across various boundaries within organizational communities of practice.

Another important mechanism is the *boundary object*. Collaborative activities such as knowledge sharing bring together different communities of practice which represent groups of practitioners from different domains. Reaching common understanding between these communities is a major challenge due to the communication divide produced by their respective cultures (Snow 1993). Boundary objects are physical objects such as product prototypes (Bechky 2003), design drawings (Bødker 1998), engineering sketches (Henderson 1991), technical machinery specifications (Karsten et al. 1991), standardized reporting forms (Bowker and Star 1994) and ISs (Levina and Vaast 2005; Schultze and Boland 2000) that are used to facilitate cooperation across boundaries by establishing a shared context that "sits in the middle" (Star 1989: p.47).

Thus, groups with distinct interests and needs appropriate and adapt them in order to accomplish a common mission. For example, the technical specification documents in Karsten et al.'s (1991) case study of a paper machinery delivery project, translate the needs of the customer to the manufacturer, and what the manufacturer is pledging to deliver to the customer. Members of each side realized during their collaboration that they need to put their knowledge into a visible format, available to the others that will effectively bridge their distinctive perspectives.

The differences in meanings and interests between communities are not only negotiated through the use of boundary objects (Henderson 1991; Carlile 2002), but also by fostering the activity of *boundary spanners* (Friedman and Podolny 1992; Brown and Duguid 1991). Irwin and More (1991) define boundary spanners as specific agents situated at different intra- and inter-organizational levels who are the buffers between the providers and the users of knowledge. Much work has been devoted to understanding the various roles of boundary spanners (Allen 1995; Katz and Allen 1985). In Katz and Allen's (1985) study, boundary spanners perform the role of *information gatekeepers* in research and development teams. They are individuals who collect and convert information from other departments and disperse it to their peers. Boundary spanners may perform the roles of *knowledge brokers* (Hargadon and Sutton 1997; Pawlowski and Robey 2004) or *translators* (Yanow 2000). These specialists assess knowledge at the boundary and select only the knowledge they consider pertinent.

In sum, boundary-spanning knowledge sharing in the *knowledge-as-possession* perspective refers to sharing not only codified information such as production and product specifications, delivery and logistics information, but also organizational members' beliefs, images, experiences, and contextualized practices (Davenport and Prusak 1998). While recognizing that the *knowledge-as-possession* perspective continues to provide interesting insights in the literature on knowledge management, in recent years a growing number of scholars have proposed an alternative perspective called *knowledge-in-practice* by Carlile (2002).

2.3.2 The Knowledge-in-Practice Perspective

Scholars who espouse this perspective argue that researchers should look at knowledge beyond its relative objectiveness or contextual and emergent nature, by defining knowledge and practice as being reciprocally constitutive (Orlikowski 2002; Levina and Vaast 2005; Blackler 1995). The theoretical foundation of this perspective is based on the tenets of the practice theories. These theories represent a theoretical perspective or an approach used by some social science scholars to examine the social world (Schatzki 2001).

The practice perspective is based on eight main concepts: *practices, knowledge-in-practice, field of practice, relational analysis, boundaries, knowledge sharing processes, boundary objects, and boundary spanners*. The term *practices* refers to "coordinated activities of individuals and groups in doing their "real work" as it is informed by a particular organizational or group context" (Cook and Brown 1999: p.387); practices are centrally organized around shared practical understandings (Schatzki 2001). Practices are also defined as being the "recurrent, materially bounded and situated action engaged in by members of the community" (Orlikowski 2002: p.256)

Knowledge-in-practice is knowledge that is "localized, embedded and invested in practice" (Carlile 2002: p.442), and encompasses two complementary epistemologies. The first, an epistemology of possession, refers to explicit and tacit knowledge and conceptualizes knowledge as something one uses in action. The second, an epistemology of practice, advances the concept of *knowing* that is used to refer to "something that is a part of action" (Cook and Brown 1999: p.387); it is something that one does as opposed to something that one possesses. Knowing represents an "ongoing social accomplishment, constituted and reconstituted in everyday practice" (Orlikowski 2002: p.252).

To better illustrate the difference and complementarity of the two epistemologies, Cook and Brown (1999) give the example of a physician at work. A physician has medical knowledge accumulated from years of school and hospital practice and this constitutes a static possession. The physician will be in possession of this knowledge even when he or she drives a car. However, the physician will use this knowledge during a medical exam and the act of diagnosing represents the epistemological dimension of that physician's practice. Therefore, *knowledge-as-possession* is something that we use in practice and *knowing* is part of the practice. *Knowing*, in the case of the physician, constitutes the actual act of making the medical diagnosis. *Knowing* is dynamic and relational. For Cook and Brown (1999), "knowledge is about possession [...] and knowing is about relation; it is about interaction between the knower(s) and the world (p.388). For Orlikowski (2002) the relational nature of knowing is reflected by the mutual constitution of practice and knowing. Reflecting on a mundane activity like riding a bicycle, the author writes: "as we bike to work every

day, we begin to take for granted that we know how to ride a bicycle and lose sight of the way in which our "knowing how" is an active and recurrent activity" (p.253).

A *field of practice* may represent business units, departments or goal-driven groups, in which individuals (or agents) who share unique sets of practices are in pursuit of a joint interest (Levina and Vaast 2005). Phenomena such as social order, knowledge, meaning, power, language, and social institutions occur within and are components of a field of practice (Schatzki 2001). Within a field of practice, agents are differentiated by their status, which is defined by the unequal access to three fundamental types of capital: *economic* capital (e.g. money), *intellectual* capital (e.g. expertise) and *social* capital (resulting from the person's institutionalized relationships of mutual acquaintance) (Bourdieu and Wacquant 1992; Levina and Vaast 2008). Agents can convert their capital into a fourth type, *symbolic capital* that is associated with the power to categorize any of the other resources as valuable (Bourdieu and Wacquant 1992), such as the ability to claim "authoritative knowledge" (Suchman 2002: p.142). Authoritative knowledge is considered by the rest of the members of a field of practice as being legitimate and useful for justifying actions by people engaged in achieving a common goal (Suchman 2002). According to Bourdieu (1989), symbolic capital is "the form that the various species of capital assume when they are perceived and recognized as legitimate" (p.17). Thus, various forms of individual capital only matter to the extent that other people in the situation value them.

Through practice, agents formalize their membership to a certain field of practice and, at the same time differentiate themselves from agents from other fields. Analyzing a given field of practice in relation to another field is called a *relational analysis* of practice (Österlund and Carlile 2005). The practice perspective suggests that every concept should be defined in relation to another concept (Bourdieu and Wacquant 1992). Such analysis demarcates a field's *boundaries* (Bourdieu 1977). It considers emerging boundaries between fields of practice as being created, recreated and transformed through recurrent practices (Levina and Vaast 2005).

Using this type of analysis, it has been suggested that knowledge management across boundaries will be more or less challenging depending on the complexity of knowledge at the boundary (Carlile 2004). Here, the level of complexity depends on the three relational properties of knowledge at the boundary: difference, dependence,

and novelty. Difference in knowledge refers to either the difference in amount of knowledge accumulated or the degree of specialization of knowledge within each field of practice involved in knowledge sharing. As the difference in knowledge across fields of practice increases, so does the amount of effort required to share knowledge (Carlile 2004). The effect of difference, however, is contingent on the degree of dependence – referred to as the extent to which two entities must pay attention to each other so as to meet their goals – among fields of practices. The third relational property is the degree of novelty of the circumstances that call for knowledge sharing. When novelty is present, "there is often a lack of common knowledge to adequately share and assess domain-specific knowledge at a boundary" (Carlile 2004: p.557). Given these properties, a boundary is said to be syntactic when differences and dependencies among practices at the boundary are known. In this case, a *knowledge sharing process* that transfers knowledge across the boundary by the creation and use of shared repositories and taxonomies is appropriate (Carlile 2002). An increase in novelty – in terms of new agents and/or new requirements – renders "some differences and dependencies unclear or some meanings ambiguous" (Carlile 2004: p. 558). In such a situation, the boundary becomes semantic and the adequate knowledge sharing process is one of translation, that is, the dealing with interpretive differences by creating shared meaning. A pragmatic boundary emerges when agents have different interests, and when negative consequences can arise from the differences and dependencies at the boundary (Carlile 2002). To alleviate these consequences, the appropriate knowledge sharing process is one of knowledge transformation, where "individuals represent, learn, negotiate, and alter the current knowledge and create new knowledge to resolve the consequences identified (Carlile 2002: p.455). Because knowledge is considered as being linked to individuals' interests within a specific context, knowledge sharing requires agents to alter part of their existing knowledge as they engage in a process of knowledge transformation (Bechky 2003).

In addition to knowledge sharing processes, mechanisms such as the use of *boundary objects* and the engagement of *boundary spanners* (Levina and Vaast 2005) exist that contribute to knowledge sharing. In the practice perspective, boundary objects are "both adaptable to different standpoints and robust enough to maintain identity across them" (Star and Griesemer 1989: p.387), which means that they have

different meanings for different communities but their structure is common enough to more than one community to make them efficient means of translation. To be useful, boundary objects should be tangible (Carlile 2002), concrete (Bechky 2003), accessible and up-to-date (Karsten et al. 2001). Carlile (2002: pp.451-452) identifies three characteristics of effective boundary objects. When used in a process of knowledge transfer, a boundary object must create "a shared syntax or language for individuals to represent their knowledge". When there are differences in interpretations of the problem at hand, an effective boundary object should provide "concrete means for individuals to learn about their differences and dependencies across a given boundary". When negative consequences are identified for the individuals involved and negotiation needs to take place, an effective boundary object will foster "a process where individuals can jointly transform their knowledge".

Knowledge-in-practice perspective in ISD literature – The practice perspective has been particularly useful for studying knowledge sharing during ISD that span inter-organizational boundaries (Suchman 2002; Levina and Vaast 2006), albeit not in a PMI context. While this literature has often considered IS as being a reliable tool for enabling business processes across boundaries, a number of empirical studies have shown that the impact of these ISs on organizational boundaries is rather unpredictable (Levina and Vaast 2006). For example, instead of sometimes enabling boundary permeability, IS reinforce existing boundaries (Schultze and Boland 2000), deteriorate community ties by replacing face-to-face contacts with less intimate, technology-based organization-clients interactions (Schultze and Orlikowski 2004), or modify the professional inter-communal relationships within an organization (Levina and Vaast 2006). These unexpected outcomes are sometimes explained by ineffective knowledge sharing (Suchman 2002).

Knowledge sharing is challenging during ISD efforts. Better approaches to sharing knowledge may avoid this problem (Byrd, Cossick and Zmud 1992), but due to the contextual nature of knowledge, often times this is not enough to develop an effective IT (Luna-Reyes, Zhang, and Gil-Garcia et al. 2005). Large ISD projects usually involve processes of knowledge sharing that cut across organizational boundaries that separate the project stakeholders within the same corporation. Suchman (2002) sheds

light on the relationship between everyday work practices and projects of new IS by advancing the idea that developers must incorporate the "knowledge of relevant practices" (p.142) into the development process to realize an IS that would meet expectations. In order to correctly assess which practices are relevant to the development of a new IS, project stakeholders must be aware of the contextual nature of knowledge on which practices are based. However, this "collective awareness" is usually impeded by a factor that Suchman (2002) calls *authoritative knowledge,* which refers to certain "ways of knowing that are taken to be legitimate, consequential, worthy of discussion, and useful for justifying actions by people engaged in accomplishing some concerted task" (p.142). Her argument, based on empirical evidence, is that assumptions about who holds relevant knowledge often supersede the known reality and create a model of practices that, when incorporated in the new IS, reinforce those assumptions.

In sum, the two epistemological perspectives of *knowledge-as-possession* and *knowledge-in-practice* that were presented in this chapter have offered and continue to offer insightful understandings of the nature, creation and process of sharing of the organizational knowledge. While the knowledge-as-possession perspective defines knowledge as being either a manageable object or an individual/collective subjective disposition, the knowledge-in-practice perspective conceptualizes it as being engaged in an intricately and reciprocally constitutive relationship with the work practices.

In this thesis we adopt a knowledge-in-practice perspective on boundary-spanning to answer the two main research questions. A practice perspective may help us better understand how knowledge is shared during IS development projects by suggesting first, that the concept of capital will enable us to identify claims of "authoritative knowledge" by examining ways of "tracing power and domination to claims of expertise" (Schultze and Leidner 2002: p. 217) within a political context involving a diverse community-based set of interests (Carlile 2004; Orlikowski 2002). Second, we need to examine the practices of individuals (Österlund and Carlile 2005). Understanding these practices is a matter of "analyzing the processes by which boundaries are constructed and maintained" (Suchman 2002: p.142).

2.3.3 Knowledge Sharing in PMI Settings

The literature on PMI makes a clear connection between knowledge sharing and value creation (e.g. Haspeslagh and Jemison 1991; Ranft and Lord 2002; Graebner 2004). According to Greenberg and Guinan (2004), two main foci of interest can be identified in this stream of research. In the first one, the authors are interested in examining the relationship between knowledge sharing and post-merger performance (e.g. Zollo and Singh 2004; Vermeulen and Barkema 2001). Due to the fact that these studies rely on quantitative methods and use large sets of secondary data, they don't capture the social and contextual aspects involved in this knowledge sharing process. As a result, this line of work hasn't been able to provide an understanding of how and why knowledge transfer does or does not take place in PMI settings (Greenberg and Guinan 2004).

Other scholars are preoccupied by the social and interpersonal strategies involved in the process of knowledge sharing (e.g. Empson 2001; Bresman, Birkinshaw and Nobel 1999). For example, in a study of a merger between professional service firms, Empson (2001) tries to better understand post-merger knowledge sharing by examining how the actions and reactions of individuals "both shape and are shaped by the nature of the organization's knowledge base and the organizational context as a whole" (p.841). The author found that when individuals perceive significant differences in terms of knowledge bases and organizational images of the merged companies, they experience fears of "exploitation" and "contamination" that trigger resistance to sharing knowledge. In another empirical study on mergers, Bresman et al. (1999) found that tacit knowledge sharing is facilitated by rich communication during and after the completion of the integration process. The authors emphasize the fact that knowledge sharing is primarily dependent on the creation of new social communities of practice following a merger.

Despite the fact that this line of work emphasizes the central place that knowledge sharing has in the PMI process, with the exception of one recent study (Yoo et al. 2007), researchers haven't paid attention to the relationship between practices of knowledge sharing and post-merger integration approaches. In their empirical article, Yoo et al. (2007) found that organizational members have created their own knowledge sharing practices by appropriating the existing knowledge resources, fact that made

upper management change the knowledge integration approach chosen. The study's main outcome was that planned post-merger approaches to implement knowledge sharing often do not match the post-merger knowledge sharing needs.

The studies on knowledge sharing in PMI conceptualize knowledge only from a *knowledge-as-possession* perspective. Some authors, such as Ranft and Lord (2002), Graebner (2004) and Hebert et al. (2005) adopt a "reification" approach of knowledge by considering it as a transferable asset. Others propose a "subjective" approach to better describe various patterns of knowledge sharing during post-merger integration (e.g. Bresman et al. 1999; Yoo et al. 2007; Empson 2001). Hence, there is apparently a lack of studies that have examined knowledge sharing through the lens of practice theories.

The review of the literature on PMI revealed that researchers who examined the "issue of boundary management" have not explored the notion of boundaries. In most studies, boundaries themselves have been taken for granted. In those studies that focused on knowledge sharing and acknowledged the co-existence of multiple professional- and departmental-based boundaries (e.g. Schweizer 2005; Lord and Ranft 2002; Empson 2001), the question of how individuals involved in collaborative efforts span those boundaries, was not addressed. Also, according to the *knowledge-in-practice* perspective, differences in practices create epistemic barriers (e.g. differences in knowledge bases) among members of different communities of practice within an organization and assessing these differences is essential to understanding organizational knowledge sharing (Brown and Duguid 2001). Knowledge embeddedness in its organizational context of creation (e.g. Cook and Brown's (1999) *genres* – knowledge that illustrates the collective know-how embedded into the structures of the fields of practices) makes it difficult to be shared during the post-merger integration (Yoo et al. 2007), especially when different practices need to be understood and shared.

Therefore, to undertake an investigation of knowledge sharing in post-merger ISD settings it is first necessary to examine the question of identification of boundaries and then the salience of different boundaries in the context of practices reflecting different integration approaches.

In the next chapter we develop a conceptual framework that allowed us to examine the dilemma of integration versus autonomy that can impact knowledge sharing in post-merger IS development.

CHAPTER 3: Conceptual Framework – Knowledge Sharing in Post-merger IS Development: A Practice Perspective

Post-merger IT integration often involves the development of new IS that will span the boundaries of previously independent organizations. These systems are aimed at enabling the implementation of the emergent work practices reflected by the adopted PMI approaches. The IS literature on PMI mentions that there is a need to develop and implement IS that will "bridge" (preservation approach), or enable a "best-of-breed" IT functionality (symbiotic approach) (Wijnhoven et al. 2006), however there is no research on how these IT artifacts are developed.

Espousing a practice perspective and building on Ellis' (2004) typology of integration approaches and on Carlile's (2002, 2004) relational analysis of knowledge boundaries, we propose a multilevel framework that examines knowledge sharing during post-merger ISD efforts. This framework allowed us to advance three research propositions that tried to answer the two main research questions and constituted the blueprint for developing a process theory on knowledge sharing in post-merger ISD settings.

The framework is based on three key premises. First, it views boundaries among fields of practice as being differentiated by the level of complexity of knowledge at the boundary, which depends on three relational properties of knowledge: *difference*, *dependence*, and *novelty* (Carlile 2002, 2004).

Second, it assumes that distinctions among agents' amounts of capital convey their relative position in a field of practice and influence their ability and inclination to share knowledge across the field's boundaries (Levina and Vaast 2008). Also, in an ISD context, the pre-existing differences in backgrounds of project participants will become more or less salient in producing status differences depending on the composition of the team and the context of work (Levina and Vaast 2008). During the process of knowledge sharing we focus on symbolic capital as the main form of capital that is assumed when the other capitals are perceived and recognized as legitimate. For an agent to acquire symbolic capital in a field of practice, that person must experience a *process of valuation.* In cross-boundary knowledge sharing, based on the possession of cultural, social, and economic capital, an agent's claims of authoritative knowledge

must be perceived as "valid" by the audience, who then attribute legitimacy to the agent (Bourdieu 1989). In this vein, the positions they fill in the field and the forms of capital agents possess matter, but only to the extent that others in the situation *value* those positions and forms of capital, converting them into a source of symbolic power.

Third, it espouses the idea that ISs do not have predefined structures of their own, and can only be defined in relation to the practices of prospective users (e.g. Luna-Reyes et al. 2005; Orlikowski 2000), or to the business processes and institutionalized values of the organization implementing the technology (Orlikowski and Yates 1994).

In this framework, the fields of practice that come into play are the merging parties, be they entire organizations, business units or business processes. The framework operates at two levels, the organizational level and the ISD level.

At the *organizational level*, we conjecture that:

> **Proposition 1**: *The planned PMI approach will shape the nature of the knowledge boundary between the fields of practice concerned by an ISD, thus creating demands on the types of knowledge sharing processes and boundary objects that the agents involved in an ISD will require for adequate knowledge sharing, as well as on the role of the boundary spanners.*

At the *ISD level*, we conjecture that:

> **Proposition 2**: *Agents, as boundary spanners, will try to convert their accumulated individual capital (knowledge-in-practice at the boundary) into symbolic capital to make claims about who holds relevant knowledge and create a new model of practices that, when incorporated in the new IS, reinforces those claims.*

> **Proposition 3**: *The planned configuration of the IS that reflects practices related to a specific PMI approach may be different from the final configuration at the end of the ISD process.*

The first proposition tries to answer the first research question and the last two propositions are concerned with the second research question.

3.1 Organizational Level

At the organizational level, our framework combines the key organizational and strategic dimensions discussed in regard to PMI (Ellis 2004), the relational properties that influence the level of complexity of knowledge at a boundary and the nature of knowledge boundaries (Carlile 2002, 2004). In addition, for each PMI approach, we propose a degree of novelty that will be required from an IS to support the combined organizations. The components of the framework at the organizational level define the key characteristics of the ISD environment.

As previously mentioned, the level of complexity of knowledge at a boundary depends on difference and dependence among the fields of practice as well as on the novelty of the context that requires knowledge sharing. We argue that in a PMI context, the degree of difference among the fields of practice is idiosyncratic to the actual context of merger and can only be assessed when one studies a given context.

As shown in Table IV, the degree of dependence among the fields of practice, however, is influenced by the degree of strategic interdependence that a PMI approach calls for. Indeed, absorption, symbiosis and transformation will impose a high degree of dependence among the merging fields of practice while preservation will leave the fields independent from each other. The degree of novelty of the knowledge sharing context will be low in a preservation approach, since the organizational structures, cultures and practices are preserved. Accordingly, the knowledge boundary is syntactic in nature and the IS that will be required to support the merged organization will not be novel. Indeed, a "bridge" between existing ISs is likely to be sufficient. Novelty of the knowledge sharing context will be high for all parties in a transformation PMI approach, since it implies the implementation of totally different, yet common, practices, culture and other organizational attributes. Consequently, the knowledge boundary will be pragmatic in this case. ISs that will be required to support an organization resulting from a transformation approach will have a high degree of novelty.

Table IV Requirements for ISD in a PMI Context

PMI Approach		Degree of Novelty of IS in Support	Relational Properties	Type of Boundary
Type	Critical components			
Preservation	No plans to integrate key business areas (no real post-merger integration)	None	Difference is idiosyncratic Dependence is low Novelty is low	Syntactic
Transformation	Old practices are abandoned; creation of a new set of values, routines; goal to implement "best practices"	Completely new	Difference is idiosyncratic Dependence is high Novelty is high	Pragmatic
Symbiosis	Both organizations undergo changes to create a combined entity that reflects the core competencies of the previously separate organizational forms	Evolution from existing	Difference is idiosyncratic Dependence is high Novelty is medium	Semantic
Absorption	Fully consolidates the activities of both organizations by assimilating the target into the acquirer	Completely new for the absorbed parties	Difference is idiosyncratic Dependence is high Novelty is high	Pragmatic

Similarly, novelty of the knowledge sharing context will be high in an absorption approach, since the party absorbing the other parties will be required to share their knowledge with their counterparts while the "absorbed" parties will have to transform their practice in accordance with that of the former. In this approach, the "absorbing party" is likely to want to preserve its exiting ISs and have the other parties use it. Hence, novelty of the IS will be low for the former party and it can be relatively high for the latter. In the case of a symbiotic PMI approach, novelty of the knowledge sharing context will not be as high as in these two situations because, as per the approach, the need for initial coexistence (organizational autonomy) followed by gradual increased interdependence is filled by a series of interactions aimed at skills transfer and operational and management knowledge exchange. In such a case, the boundary is semantic in nature. Because of the gradual nature of practice modification, we contend that the ISs that will support this approach will evolve from existing ISs.

The development of ISs to support the processes of the merged organization is likely to involve agents from the fields of practices affected by the merger. Table IV identifies the key elements of the environment where ISD will take place. As shown in Table V, at the ISD level, our conceptual framework identifies the main characteristics that the boundary objects that will be used for knowledge sharing during ISD must possess to be effective, the key roles played by agents' individual capitals during ISD, and the potential requirements put on boundary spanners.

Table V Main Characteristics Boundary Objects, Status, and Boundary Spanners

Type of PMI Approach	Boundary objects	Differences in Status	Role of Boundary Spanners	Type of Boundary
Preservation	Syntactical tools ▪ Taxonomies	Differences in individual capitals are irrelevant	Not relevant	Syntactic
Symbiosis	Standardized forms and methods: ▪ Lotus Notes ▪ Gatekeeper technologies	Important differences in individual capitals	Will mitigate agents' status differences to establish effective knowledge sharing	Semantic
Transformation	Models ▪ Prototyping systems ▪ Mock-ups ▪ Modeling software		On each site of the boundary they will use their symbolic capital to claim "authoritative knowledge"	Pragmatic
Absorption			Boundary spanners from the "absorbing" party will use their symbolic capital to try to legitimize their knowledge base	

It must be specified that the utilization of the framework doesn't have as a goal the testing of the four ideal PMI approaches, but rather to find relationships between these approaches and the different types of knowledge boundaries that emerge during post-merger IS developments.

3.2 IS Development Level

In a preservation approach, agents involved in ISD projects will be faced with a syntactic boundary, across which the appropriate knowledge sharing process is considered as being one of knowledge transfer. In this approach, effective boundary objects used by agents are likely to be syntactical tools such as *taxonomies* that will

have the role of providing an integrated viewpoint when elaborating definitions and norms for practices. As an example, despite granting operational and cultural autonomy to the merging entities, the new organization, from a legal standpoint, needs to provide unified financial services. Developing an IS to enable such a cross boundary business process (i.e. cost database) requires boundary spanners to define a set of symbols according to an existing taxonomy or set of rules (i.e. government regulations). In this situation, the differences in intellectual and symbolic capitals at the boundary in capitals are irrelevant.

In a symbiotic approach, where the knowledge boundary is semantic in nature, the boundary objects used by agents should enable processes for translating the differences and dependencies at the boundary. They will use *standardized methods* that may include standardized information infrastructure-based technologies such as Lotus Notes (Hanseth and Braa 2001), or gateway systems (Hanseth 2001) to assess their knowledge differences and dependencies and identify common meanings. The amount of intellectual capital is important in this case. The higher the volume of knowledge in practice accumulated on each side of the boundary, the harder the identification of common ground for knowledge sharing. The symbiotic approach provides an evolutionary path for gradual PMI by trying to avoid the conflicting tensions between the merging parties by ensuring a simultaneous boundary preservation and boundary permeability. Thus, some agents will play the role of boundary spanners and use their symbolic capital to alleviate the conflicts generated by the agents' status differences and promote practices of knowledge sharing (Levina and Vaast 2008).

Transformation and absorption create a pragmatic knowledge boundary and therefore effective knowledge sharing requires a transformation of practices. Hence, the agents involved in an ISD aimed at supporting the new organization must engage in a process of knowledge transformation. In addition to the syntactic and semantic components that boundary objects must have, *models* are considered effective boundary objects for a pragmatic boundary as they enable "a process where individuals can jointly transform their knowledge" (Carlile 2002: p.452) and provide an infrastructure where new forms of knowledge are produced and shared. In an ISD context, these may include *prototyping systems and modeling software* (Leonard-Barton 1995; Schrage 1999). These IS must provide a means for creating a form of

"common ground" (Bechky 2003) that will facilitate the engagement of agents in activities that transcend different fields of practice. Prototyping has been recognized in IS literature as being an effective strategy for information requirements determination. This strategy has been described by Davis (1982) as "discovering from experimentation with an evolving information system" (p.12). Prototyping is recommended in situations where requirements to develop an IS can't be determined "correctly and completely", therefore "users may need to anchor on concrete systems from which they can make adjustments" (Davis 1982: p.19).

However, we suggest that in an absorption approach, knowledge sharing during ISD is difficult. In this approach, while both parties, "absorbing" and "absorbed", are likely to want to preserve their existing practices, the "absorbing" party will want to develop new ISs that will enable them. During ISD efforts, boundary spanners from the absorbing party will use their symbolic capital to try to legitimize their knowledge base in the eyes of the "others" in order to ensure efficient knowledge sharing. While in the absorption approach, manifestations of symbolic capital are likely to be encountered on the "absorbing party" side, in the transformation approach, they will be seen on each side of the boundary. In the latter situation, the high degree of novelty of the knowledge sharing context generates different interests among agents that may influence the way they classify the authoritative knowledge during IS development projects. These differences are based on the old organization affiliations in terms of identity and cultures (Balogun et al. 2005; Vaara 2001; Riad 2005). In both absorption and transformation approaches, the lack of shared intellectual and symbolic capitals will shape the boundaries during ISD initiatives, "leading to power dynamics that undermine collaboration" (Levina and Vaast 2008).

Finally, regardless the integration approach, we posit that the features of the IS that will result from the ISD project will not necessarily reflect the practices, norms and values promoted by a specific integration approach. Rather, they will reflect the agents' understandings of the others' practices as they are influenced by the relational properties of knowledge at the boundary and the differences in symbolic capitals on each side of the boundary. The pre-merger assessment of the boundaries between fields of practice within the previously independent firms is important for identifying how to differentiate the agents on the basis of their practices and determining what

integration approach is the most appropriate. However, these boundaries, as Levina and Vaast (2008) suggest "become salient or stop mattering as practices evolve". Information systems under development have the capacity to continuously unfold, as they are not static, fixed, or given. According to Knorr-Cetina (2001), they can be characterized by their "lack in completeness of being" (p.181). Thus, through the process of knowledge sharing, ISs are continuously defined and change their properties (e.g. updates and "patched-up" new releases of ERP systems). These ISs do have some material instantiations (e.g. specific software versions), but their functionality will continuously evolve during their development. This may result in a final product with different functionalities than the ones defined in the initial design.

The practice perspective on boundary-spanning knowledge sharing has shown that micro- and macro-levels of analysis can be simultaneously studied by focusing on "how macro-phenomena are constituted by micro-interactions, and how those micro-interactions, in turn, are shaped by macro-influences and effects" (Schultze and Orlikowski 2004; p.88). The proposed framework will constitute the analytical tool that will help us approach the post-merger IS development from a multi-level analysis perspective and propose a process theory of knowledge sharing.

A process theory explains how a sequence of events that unfolds through time leads to some outcome (Van de Ven and Poole 1995). According to Poole (2004), process theory can provide explanations on how one micro-level event leads to and affects the ensuing one. It can also shed light on how a macro-level pattern may trigger the succession of micro-level events. In this viewpoint, development of an IS represents a process that entails a "sequence of individual and collective events, actions, and activities unfolding over time in context" (Pettigrew 1997: p.337). *Events*, the main elements of a sequence, can be defined as being instances of social action relating to the IS development process (Hirschheim, Klein, and Newman 1991). The resulting view of the process tells a rich and detailed story of the events taking place within a target situation by explaining how influential factors interact, such as knowledge sharing and boundary definition, how they collectively lead to future action, and what constrains them.

Moreover, the dynamic approach of the process theory seeks a holistic explanation and assigns temporal, pluralistic and asymmetrical properties to an

organizational process. Indeed, a processual approach is a fruitful choice when viewing IT as an open and dynamic artifact (Walsham 1993; Orlikowski and Iacono 2001) and when drawing on theories such as practice perspective (Levina and Vaast 2005).

The next chapter presents the empirical approach.

CHAPTER 4: Research Methodology

Developing a process theory about boundary-spanning collaboration and knowledge sharing involves close examination of the everyday practices of individuals involved in them (Bourdieu 1977; Levina and Vaast 2005). To learn how people share knowledge in post-merger IS development settings, this thesis used a qualitative retrospective multiple-case design within the same organization, allowing a "replication" logic (Miles and Huberman 1994; Yin 2003), in which each case was used to confirm or disconfirm the inferences drawn from the others (Eisenhardt 1989). For data collection we relied on open and semi-structured interviews, documents, and archival data.

This chapter is organized as follows: we first discuss the rationale underlying our methodological choice (section 4.1). Then we lay out the case study design by describing the case sampling and the data collection methods (section 4.2). In section 4.3 we describe the strategies for analyzing process data. In section 4.4 we address the issue of research quality (Miles and Huberman 1994; Lee and Baskerville 2003). Finally, in section 4.5, we focus on a potential number of ethical issues related to our chosen research strategy.

4.1 The Rationale for the Methodological Choice

The case study represents "a research strategy which focuses on understanding the dynamics present within single settings" (Eisenhardt 1989: p.534). A case study methodology provides the researcher with sustained and extensive exposure to the phenomenon under study (Yin 2003). In this way, the researcher is able to identify emerging dimensions of the phenomenon and the relationships that emerge from the study through the researcher's interaction with the organization members within their context (Stake 1995). The research strategy adopted in this thesis was influenced by the type of research questions (Yin 2003) and by the researcher's epistemological orientation (Patton 2002).

4.1.1 Type of Research Questions

Keeping in mind the study's goals, that is, to understand the process of knowledge sharing in ISD during PMI, the research strategy needs to support the development of a process theory. This strategy also must enable us to build a data repository rich enough to answer the two research questions posed by the study:

- *How do agents from merging organizations, engaged in an IS development during PMI, share knowledge of the work practices required by a specific PMI approach?*

- *How do interactions among agents engaged in knowledge sharing during IS development in PMI, influence the resulting IS functionality?*

The review of the practice perspective in chapters 2 and 3 has revealed that such a theoretical lens, when used to examine collaboration and knowledge sharing, allows for the development of a temporal, process-based theory. While the main constructs used by the practice perspective, such as boundaries, boundary objects and field of practices, are clearly defined in the literature, we do not have an in depth understanding of the relationships between these constructs in the context of IS development in PMI settings. The literature on PMI shows that post-merger boundaries between the merging firms are ambiguous, and it makes little sense to attempt to control the research conditions.

Thus, we chose a qualitative research approach. Qualitative inquiry, when studying organizational processes, involves performing research in the real world of organizations and "getting close enough to the people and circumstances there to capture what is happening […] This makes possible the description and understanding of both externally observable behaviors and internal states (worldview, opinions, values, attitudes and symbolic constructs)" (Patton 2002: p.48).

The evaluation of an IS development process entails considering a number of activities and events, including their sequence. Hence, in this thesis we aimed at developing a process theory of the IS development in a PMI context. We regard process theory as being "an explanation of how and why an organizational entity changes and develops" (Van de Ven and Poole 1995: p.512).

Process and variance theories differ in three main aspects (Markus and Robey 1988): a) while variance theories posit the precursor as being a necessary and sufficient condition for the outcome, process theories present the precursor as being necessary, but insufficient to trigger the outcome; b) variance theories advance linear cause-and-effect types of relationships under contingent conditions between antecedents and outcomes. Process theories posit that the outcome may or may not happen considering the same contingent conditions, but temporal ordering is critical to outcome; and c) process theories define outcomes as being discrete phenomena, whereas variance theories hypothesize them as variables that reflect a range of values.

Case study represents the methodology of choice when process research is intended because an organizational process can be better identified or reconstructed by using qualitative methods of inquiry (Poole 2004; Chia and MacKay 2007). A number of IS scholars who developed process theories have conducted their research through longitudinal case studies. For instance, Leonard-Barton (1990) used such a method to investigate the process of innovation (development of new technologies and software tools), as did Davidson (2002) in her study of the socio-cognitive process of system requirements identification during IS development projects.

A possible limitation of retrospective case research is the challenge of determining cause and effect from reconstructed events. Although studies have shown that the participants in organizational processes do not forget key events in these processes, there are chances that the participant-informant in a retrospective study may not have judged an event as important when it occurred and therefore may not remember it afterwards (Leonard-Barton 1990). Traditionally, researchers adopting the practice perspective have used ethnographic methods to examine how individuals engage in daily practices (for ex. Orlikowski 2000; Levina and Vaast 2005; Bourdieu 1977).

However, this research strategy doesn't always give the expected outcomes. For instance the three-year study undertook by Leonard-Barton (1990) did not achieve the expected depth of ethnographic immersion. The author had to spend many days and evenings at the site under study, because the phenomenon of interest, namely the development of a new IS, could not be totally described by the formal meetings. Indeed, many critical events occurred outside of the formal situations. Much of the

useful data emerged from informal conversations at lunch and in hallways. However, to understand the meanings held by the organizational members, one must enter into the organizational culture by understanding its shared values and speaking its language. Researchers, who undertake a research project in their own organizations, are already immersed in the organization and have built up intimate knowledge of the organization (Nielsen and Repstad 1993).

In this study, the fact that the researcher, as a member of the organization for more than 10 years, had knowledge of the organization's norms and practices compensates for the possible research strategy weakness of using retrospective cases. He knew the everyday hospital jargon. He knew the legitimate and taboo phenomena of what can be talked about and what cannot. He knew how the informal organization works and to whom to turn for information and gossip. When he inquired, he drew on his own experience in asking questions and interviewing and was able to follow up on replies, thus obtaining richer data about how organization members engaged in specific practices. The researcher, as an insider, was in a better position to elucidate meanings in events that occurred in an already familiar environment.

4.1.2 The Researcher's Epistemological Orientation

All research, whether quantitative or qualitative, is based on some underlying theoretical assumptions about what constitutes valid research and which research methods are appropriate (Patton 2002). Our research approach is based on the *pragmatism perspective* which suggests that researchers should use whatever methodological strategy that works best to study a specific phenomenon of interest (Goles and Hirschheim 2000). Pragmatism is concerned with what works and reflects the utilitarian arguments that what matters is what has utility to the individual. Pragmatists aim "to supersede one-sided paradigm allegiance by increasing the concrete and practical methodological options available to researchers and evaluators" and to avoid "methodological orthodoxy in favor of *methodological appropriateness* as the primary criterion for judging methodological quality" (Patton 2002: pp.71-72).

Pragmatism adopts a middle position between positivism and interpretivism in terms of ontological stance. While considering reality as being objective, it also sees it as being "grounded in the environment and experience of each individual, and can only

be imperfectly understood" (Goles and Hirschheim 2000: p.261). Here, reality has a processual dimension. According to Strübing (2007), "reality is not 'out there' but rather continually in the making on the part of active things" (p.583). For the pragmatists, theories are instruments or tools for solving practical problems and should be judged primarily by their consequences, not by their origins or their relations to antecedent data or facts. The "practical" dimension of a problem refers to the "concept of action, expanded to include processes such as understanding objects and relations between them" (Strübing 2007: p.596). Thus, when it comes to how and what we know, the pragmatist perspective emphasizes the importance of studying *knowing,* that is "understood as part of concrete, dynamic human action", rather than *knowledge-as-possessed* that is considered static and abstract (Cook and Brown 1999: p.387).

As a result, an organizational phenomenon, such as boundary-spanning knowledge sharing in PMI cannot be adequately explored without having access to the natural settings where organizational members make sense of their reality, where they engage in action (knowing) that creates knowledge. Thus, we will use a case study methodology in this thesis.

4.2 Research Design

According to Yin (2003), the research design represents "a logical plan for getting from *here* to *there*, where *here* may be defined as the initial set of questions to be answered, and *there* is some set of conclusions (answers) about these questions" (p.20). Drawing on the works of Miles and Huberman (1994), Patton (2002), Stake (1995), Yin (2003) and Eisenhardt (1989) we found that three elements are of great importance when elaborating a coherent case study research design: 1) Choice of *a priori* theorizing; 2) Case sampling; and 3) Data collection methods. Each of these factors will be further addressed.

4.2.1 Choice of A Priori Theorizing

While for Eisenhardt (1989) case-based theory development research must begin as "close as possible to the ideal of no theory under consideration and no hypotheses to test" (p.536), Yin (2003) believes that a priori defined research

propositions will point the researcher to areas that need to be studied and where to look for relevant data. In a similar view, Miles and Hubeman (1994) posit that a conceptual framework becomes a "researcher's first cut at making some explicit theoretical statements" (p.91). In this thesis we adopt the latter view. With that in mind, we developed a conceptual framework – presented in Chapter 3 – that constitutes an analytical tool for studying practices of knowledge sharing during post-merger ISD efforts along three intersecting relational forces (differences, dependencies and novelty).

Previous studies (Orlikowski 2002; Vaast and Walsham 2005; Levina and Vaast 2008) have illustrated how practice theory concepts can be used in case study research to understand the dynamics of organizational life and develop practice-based theoretical frameworks. Following the same line of work, the framework advanced in this proposal is based on six main practice theory concepts: field of practice, status, boundary, level of knowledge complexity at the boundary, boundary object, and boundary spanners.

We define a *field of practice* as an autonomous space, in which organizational members (or agents) share practices in pursuit of a common goal. According to the practice perspective (Bourdieu 1977; Levina and Vaast 2008), within a field, agents are differentiated by their *status* – defined by unequal access to three fundamental types of capital (resources): economic capital, intellectual capital, and social capital. Through practices of knowledge sharing these agents can reproduce, transform or convert one of the three main types of capital into a fourth type, symbolic capital. This type of capital is associated with the power to categorize any of the other resources as valuable (Bourdieu and Wacquant 1992). By engaging in practices relevant to a certain field, agents differentiate themselves from agents from other fields. From this, *boundaries* among fields of practice emerge (Bourdieu 1977). It has been suggested that knowledge management across boundaries will be more or less challenging depending on the *level of complexity of knowledge at the boundary* (Carlile 2004). Here, the level of complexity depends on three relational properties of knowledge at the boundary: difference, dependence, and novelty. *Boundary objects* are used to facilitate knowledge sharing across boundaries by establishing a shared context. *Boundary spanners* are specific agents situated at different intra-organizational levels

perform the roles of "knowledge brokers" (Pawlowski and Robey 2004) or "translators" (Yanow 2000), by assessing knowledge at the boundary.

The proposed framework represents a statement of what we believe to be the important aspects of the phenomenon under study; it should not be viewed as a rigid set of propositions, but rather as a theoretical lens which guides data collection, interpretation and analysis. When theory development is sought, a proposed theoretical framework should be open to modification and elaboration and should represent just a preliminary view. Thus, as stressed by Patton (1990) and Yin (2003), even though early identification of possible constructs allows them to be explicitly measured in interviews, it is also important to remember that these constructs represent just a blueprint for theory-building research.

4.2.2 Case Sampling

According to Yin (2003), one of the most important components of a case design is related to the fundamental question of "defining what the case is" (p.22). A case may be simple or complex. It may be an individual, an IT, or an organization, to name just a few examples. Despite the fact that a common approach to case design is to treat a "case" as being a monolith, Miles and Huberman (1994) and Yin (2003) argue that while the case is the unit of analysis, there might be "subcases" or other units of analysis embedded within it. This occurs when, within a single case, attention is also given to a subunit or subunits. For example, Paré (2002) conducted a multiple-case study to explore the implementation of three different IS in three different clinical units within the same hospital. The author defined each ISs project as a separate "case". In another empirical work, Leidner and Jarvenpaa (1993) performed a multiple-case study to examine how IT is used in a number of classrooms in one university and how IT-based teaching methods are different from traditional teaching methods in terms of class interaction and in-class accumulation of knowledge. In this study, the primary unit of analysis (the case) was a course and the embedded unit of analysis was every student enrolled in each course.

Clearly defining the unit or units of analysis is an important part of building theory from case studies (Stake 1995, Eisenhardt 1989). According to Patton (2002), the selection of the unit of analysis is influenced by what the researcher wants to be

able to say at the end of the study. In our study, we wanted to understand how individuals, within project teams, share knowledge during the development of a new IS in a specific context such as PMI. Thus, given the limited number of cases that can be chosen to study this phenomenon, a theoretical sampling was chosen. Theoretical sampling ensures researchers that they "choose cases which are likely to replicate or extend the emergent theory" (Einsenhardt 1989: p.537). It can also shed light on the manifestations and meanings of a predefined concept as it is found in the data collected during the fieldwork (Patton 2002). Having considered all of these, we chose three retrospective cases representing three implemented IS development projects within one organization that was engaged in the process of post-merger integration.

The selected organization was the Teaching Health Centre[6] (THC), a Canadian tertiary care teaching institution. This organization was chosen for this study for several reasons:

- Public sector Canadian hospitals have collective leadership structures that manage differences during a post-merger phase in a different way than management in a traditional corporate merger does. In their 1999 paper on two large Canadian hospital mergers, Denis et al. found that successful post-merger integration in such settings is defined by a series of departmental "micro-mergers" due to the fact that each care unit transforms itself over time into a unique community of practice where work norms and professional relations take idiosyncratic forms.

- Most teaching healthcare centers display structural arrangements such as: "decentralized decision making; high-levels of professional autonomy and power" (Kitchener 2002: p.393).

- The choice of the site was also influenced by the fact that the researcher has significant experience in IT-related work in the healthcare milieu and, as an insider of this organization had direct access to the main sources of data.

The THC is the result of a "merger of equals" of five independent teaching hospitals. A merger of equals results when the merging companies, often of about the same size, agree to go forward as a single new company rather than remain separately

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[6] The names of the organization, their members, and the specific IS development projects are disguised for ethical reasons.

owned and operated. Even though the THC comprises five sites, from structural and decisional viewpoints there were only three main partners in the merger: two adult hospitals, the Downtown and the Midtown, and the Paediatric hospital. The other two hospitals, that were much smaller than the other three, had historical collaborative ties to the Downtown hospital due to their geographical proximity and provided specialized healthcare services. One is specialized in neurological disorders (Specialty1 hospital) and the other one in infectious diseases (Specialty2 hospital). This "reality" is reflected in the archival documentation and in the interviews, by the many references to differences, on one hand, between the Paediatric site and the adult sites, and on the other hand between the two main adult sites, the Downtown and the Midtown.

The THC merger was formally announced in 1998. The initial goal of the merger was, according to the final report of the THC Steering Committee released in 1994, to provide 21st century health care in a new, efficient, caring environment adapted to the changing needs of patients. In 1997, according to a Patient Services Steering Committee report, the THC's operational strategy is to create a "best practices" business model for coordinating care and IT's role was to support the goal of providing coordinated, seamless and individualized care to patients. Thus, by clearly articulating the strategic vision of the new organization to all stakeholders, by proposing the implementation of new best practices, and by using specific task forces in key functions (Ellis 2004), upper management decided that a *transformation* integration approach would be adopted in the post-merger phase.

Although more than ten years have elapsed since the provincial Ministry of Health agreed to this merger, and hierarchically reorganized the five hospitals into one legal entity, they are still geographically dispersed and keep separate most of their clinical information systems. This means that at the time of the writing (Fall 2009), the PMI phase is still ongoing and that the PMI issues are contemporary in the organization. The communication between the various patient databases and applications still relies on over 100 different interface engines that provide the role of "gateways".

Due to their clear boundaries in terms of stakeholders, we decided to consider three IS development projects as our objects of research. In each case, the IS considered for development was meant to accommodate business processes that span

all 5 previously independent hospitals, known now as sites of the THC organization. Following the logic underlying the use of multiple-case design the three cases were selected to maximize variation and allow comparison (Guba and Lincoln 1989), thus predicting "contrasting results but for predictable reasons (a theoretical replication)" (Yin 2003: p.47). Within these cases we focused on episodes of knowledge sharing among project team members that constituted our unit of analysis.

As an "insider", the researcher was able to have informal conversations with a number of IS professionals from the THC IT departments that were previously involved in several post-merger IS development projects. The information received pointed to 6 post-merger ISD projects that were completed within the last 10 years and having as goal to enable business processes that cover all 5 sites of the new health centre. It must be noted that the researcher was not involved with any of these 6 ISD projects. Then we informally interviewed 12 main stakeholders (two for each ISD project). We were interested to find if the new "best practices" identified at the outset of the post-merger phase were successfully enabled by the new IS. In order to be able to assess any difference between the initial integration approach and the resulted one, we used the coding scheme developed by Ellis (2004) to classify the manner in which organizations combined the operations of the previously independent firms. The coding scheme is based on three sets of process dimensions of each integration approach (Ellis 2004: p.119). We chose to focus on three key dimensions: operational autonomy; best practices; and existence of an environment that fosters collaboration. During the conversations we were looking for specific sentences that would refer to: 1) if the business process enabled by the new IS reflects "new practices", "old practices", or a "blend" of previous practices ("best-of-both" approach); 2) if the new IS would trigger any plans for restructuring; and 3) if words such "assimilate, absorb, blend, or retain" were used to describe the process of integrating" (Ellis 204: p.122) of the work practices reflected in the functionality of the new IS.

The information obtained made us decide to retain three ISD projects. As shown in Table VI, similarities and variations of three characteristics of the cases were: type of business process enabled by the developed IS, initial integration approach, and final integration approach. All three ISs were successfully implemented. In terms of similarities, all three ISs were initially supposed to enable a transformation approach

for PMI. In terms of variations, three different types of business processes were taken into consideration that would be enabled by the IS to be developed and two different final integration approaches were adopted.

The first case examines the development and implementation of a centralized patient ambulatory appointment scheduling service. The ambulatory appointment information system (AAIS) is used in all the outpatient clinics of the THC. However, the final functionality of the IS reflects 2 different instances of the same application, one for the adult sites, and one for the pediatric site. In order to ensure efficient patient appointment scheduling, the pediatric site was granted autonomy for this business process and the IS functionality was tailored to accommodate the previously independent Pediatric hospital's practices. Thus, across the organization the patient appointment scheduling service presents a blend of new "best practices" (transformation approach) and practices used prior to the merger (preservation approach).

Table VI Selected Cases

	Business Process	**Planned PMI Approach**	**Final PMI Approach**	**Timeline**
Case 1	Patient Appointment Scheduling	Transformation	Mix of Preservation and Transformation	1997-2003[7]
Case 2	Laboratory Services	Transformation	Mix of Preservation and Transformation	2003-2006
Case 3	Clinical Information Management	Transformation	Mix of Symbiosis and Transformation	2004-2008

The second case is concerned with a new laboratory system (LIS) aimed at improving the laboratory services of the new organization. The laboratory services are provided by several different but related clinical units, such as, haematology, microbiology, cytology, and pathology. The final configuration of the IS reflected a final business process in which a blend of new best practices (transformation approach) and preservation of practices (preservation approach) are present.

The third case is concerned with the development and implementation of the Clinical Display (CD), the main module of a Clinical Information System (CIS), which is

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[7] Even though it has been five years (time of the interview process) since the project has been finished, several project-related documentation (e.g. minutes of meetings, progress reports, technical documentation pertaining to the ISD process, and e-mails) will fill the potential gaps in interviewees' memory.

a software application that collects and organizes information from various systems such as laboratories, the pharmacy, and transcribed reports. The resulted functionality reflected a blend of new best practices (transformation approach) and "best-of-both" type of practices (symbiotic approach).

4.2.3 Data Collection Methods

The main method we used for generating empirical material was the interview. We interviewed key stakeholders, in particular project development and implementation committee members (i.e. department managers, IS professionals, project managers, clinicians) who participated in the development and implementation of the new ISs. A total of 9 interviews were carried out (6 interviewees in 2 rounds of interviews) for the first case (the AAIS project). For the second case (LIS) we interviewed 15 project stakeholders. For the third case (CD) 9 project stakeholders were interviewed. A total of 33 interviews were performed for the three case studies (Table VII). Four interviewees (3 in Case 1 and 1 in Case 3) were hired by the THC at the beginning of the 2000s so they are not counted in this table. Every interviewee is described in a table at the beginning of the data analysis of each case. Data collection stopped when it reached theoretical saturation.

Table VII Site characteristics and interviewees' membership

		Midtown	Downtown (including specialty sites)	Paediatric
Main IT characteristics of the hospital partners (1998)[8]		Level I trauma center; 850 networked users; IBM mainframe, Unix, Novell and Microsoft platforms for clinical applications	Main birthing center and surgical unit; 1,100 networked users; similar platforms as Midtown	Important imaging and Telemedicine unit; 500 networked users; HP midrange, Unix, Microsoft platforms for clinical applications.
No. of interviewees	**Case 1**	1	1	1
	Case 2	8	4	3
	Case 3	3	3	2

The interviews were conducted between August 2008 and May 2009. In the semi-structured interviews, the discussion was guided by a series of open-ended

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[8] Characteristics based on IS support archival documentation; in November 2009 the IS department at the THC was counting 6,500 network nodes.

questions that allowed the informant to relate his or her experiences. The interviews were based on an interview protocol (presented in Appendix F) that lists the questions or issues that were explored during the interview. These questions helped us to explore "the concrete experience of people in that area and the meaning their experience had for them" (Seidman 2006; p.16). The interview protocol provided the necessary foundation of detail that, while ensuring the same basic lines of inquiry are followed with each interviewee, the interviewer remains free to engage in a conversation that will foster emerging questions that focus on predetermined subject (Patton 2002).

The interview protocol comprised a combination of three interview strategies (Patton 2002). Each interview started with an *informal conversational strategy* in which questions surfaced from the context and usually were tailored to each individual. This approach was followed midway through the interview by a *guide strategy* with a standard format that clearly spelled out the topics and issues that needed to be covered. The interviews ended with a *standardized open-ended interview* in which respondents answered the same basic questions in the same order. This last part was necessary to get systematic data, thus increasing comparability of responses that allowed cross-case comparisons (Miles and Huberman 1994). The interviews were taped and transcribed. In a few instances, in addition to these interviews, follow-up questions were usually asked via phone or email in situations where clarification was necessary. We also did three follow-up interviews.

Interview questions focused on understanding, from the participant's standpoint, the history of the ISD projects, types of boundary objects used during the ISD process, roles of boundary spanners, collaboration practices, claims of relevant knowledge and differences in IS' functionalities between the initial and the go-live phases of the project. Table VIII presents a summary of the interview questions and their link with the conceptual framework.

Interviews were conducted with the main ISD project stakeholders: project managers, project sponsors, IS developers, and representatives of the target business processes. Initial respondents were the project managers. Subsequent participants were identified through a snowballing sampling strategy as well as through the analysis

of archival data. The sample included participants from the three main THC sites[9]. The interviewees were significant in regards to being agents in influencing the knowledge sharing process because of their role, status, power and experience.

Table VIII   Interview Open-ended Questions

Concepts / Related Research Proposition	Questions
Individual Status	Please tell me about your background (academic also) and how you came to be in this position? What was your role in the previously independent hospital *(if applicable)?* What was your role in the project?
Initial IS design Functionality / P3	In your opinion, was there a clear link between the initiative to develop and implement this IS and the upper management post-merger integration strategy?
Fields of Practice at the Outset / P1	At the beginning of the project, were there any differences in work practices and norms between the sites/ departments? If yes, were these differences site- or lab-based? How would you assess these practices – some differences, very different, or can't compare? How many practices would you clearly identify? Describe Can you describe the position within the department/hospital of the major players involved in the SD process? How different do you think that each hospital (site) were in terms of organizational culture (values, traditions, organizational identification of each hospital's members)? The same, some differences, very different, can't compare? Do you feel that these differences had played a role in the process of collaboration (information/knowledge transfer/share) during the ISD project? Please describe a concrete example.
Knowledge Complexity at the boundary / P1	Differences Were there any challenges/difficulties at the outset of the project due to differences in knowledge on work practices of the other sites? Were you able to correctly assess these differences at the outset of the project? Or did you discover them during the IS development? How would you describe the level of differences in knowledge? Low, medium, high? Why? Dependency Were you dependent on other resources (ex. documents, other employees) to successfully acquire the necessary knowledge to develop the IS? Were you able to correctly assess these dependencies (ex. persons that would be knowledgeable about the system)? Novelty How would you describe the level of novelty of the context (team members, system functionality, Organizational / departmental context)? Have you (and the others for that matter) ever been involved in developing a similar application? Negative consequences Did you feel at outset that negative consequences related to the development of the new system (ex. political pressure, work-related) will arise?
Boundary Objects / P1	During your efforts to develop the system, what kind of tools and/or techniques you and your colleagues use to represent the design of the application (ex. Technical documents, screen snapshots, product prototypes, screen mockups, undocumented standards built

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[9] During the interviews for all three cases, the interviewees from the Downtown site considered themselves as representing also the two specialty sites.

	on consensus etc.)?
	What were the means for collaborating (information/knowledge transfer/share) with the other team members during the ISD process (ex. Documentation, e-mail, etc.)?
Final IS design Functionality / P3	In your opinion, how different was the functionality of the final version of the system from the initial (planned) design?
Fields of Practice at the Outcome / P1	Once the IS was implemented, did the work practices of the users of the new IS change? If yes, how different were they at the end of the implementation (or now) from how they were at the outset of the implementation of the IS?
	How would you describe the change in these practices today: it was marginal or it touched the core of the practices?
Individual capital / P2	Did you find that there were other team members that you find them influential during the ISD due to their expertise, knowledge, status within the organization? Which ones?
	What was the main benefit of having these individuals as members of the team for the ISD outcomes?
	Why do you think that their input was valuable?
Actions of Boundary Spanners / P1	Would you call yourself a boundary spanner? (definition - *enables/promotes/control communication and collaboration across boundaries between groups/practices/departments/sites*) If yes, what were your actions as boundary spanner?
	Decisions regarding the design of the system were taken during the development process – do you think that these decisions were influenced by some of the team members (ex. Nurses)?
	Did any of the team members try to influence the way the system was designed? If yes, do you think that this was due to their prior experience in the domain, their knowledge, or the fact that they were reflecting the needs/interests of the community that they were representing?
	Can you think of an incident when you and the rest of the project stakeholders did not agree about the functionality of the system? How often did this happen? Did you try to convince the others of your decision? How? If not, why not?

Archival and historical data – The practice perspective (Bourdieu 1977; Levina and Vaast 2005) emphasizes the importance of a temporal perspective; therefore a processual method highlights the importance of archival data. These were of substantial value since they enabled us to follow the whole process of IS development as events unfolded. While the interviews often offer respondents' reflection on past events, archival data are closer to the moment when the events took place. We were granted access to internal archival data including ISD project documentation (i.e. progress reports, minutes of meetings, operational documents, memorandums, technology proofs of concept), monthly newsletters, THC strategy documentation (i.e. integration guidelines and/or early PMI approaches sketches), and organizational and policy documents. External archives included numerous newspaper articles that have been published on the merger, governmental documents, and other publicly available documents.

Archival material played an important role in this study, particularly the minutes of the various development and implementation group meetings and emails exchanged between the project group members. We also used other texts, such as project management plans, PMI management strategy documentation, management presentations, schemes of governance structure, communication plans, as well as media documents. The archival documents were used in four ways. First, the various reports and presentations were used to assist us in putting together the projects chronology, including identifying the dates of important events and decision junctures. Second, emails and management presentations were used to formulate and refine interview questions. Third, reports and meeting minutes were used to corroborate and validate interview reports. Finally, meeting minutes provided us with some "ethnographic" sense of the project work.

The next section presents our approach to analyze and interpret data.

4.3 Data Analysis and Interpretation

The understanding of the phenomenon was achieved through a focus on work practices. In this thesis we made a clear differentiation between clinical practices (ex. medical diagnostic and treatment) and patient information management practices. We were only concerned by the latter. Based on the definition of the concept of Health Information Management by The American Health Information Management Association (AHIMA) we defined practices of patient information management as being *the practices of introducing, acquiring, analyzing, and protecting digital and traditional medical information vital to providing quality patient care*.

Practices are usually embedded in configurable information systems (Pozzebon and Pinsoneault 2005). Configurable ISs refer to those technologies that encompass a set of software modules in which default data parameters, provided by the software manufacturer, must be adapted to satisfy local requirements. This process involves standardization of practices across departments and organizations (Markus and Tanis 2000). The interest in configurable ISs in the healthcare sector has emerged in the '90s been accompanied by discourses about collaborative practices – inter- and intra-organizational, inter-professional, managerial and clinical (Safran and Goldberg 2000).

Resulting of these discourses, collaborative practices often appear supported by IT artefacts that have as goal to integrate clinical information existing in a healthcare organization (Xiao 2005). The three ISD projects analyzed in this study had as a goal to implement three configurable software packages.

The main challenge of qualitative analysis lies in making sense of large amounts of data (Eisenhardt 1989). A qualitative inquiry to develop a process theory entails challenges due to the vast quantity of data it generates. As Langley (1999) indicates "process data is messy" (p.691) which often triggers what Pettigrew (1990) metaphorically called "death by data asphyxiation" (p.281). However, there are different strategies for analyzing process data that aid to diminish the complexities of processual studies (Langley 1999). Inspired by the works of Patton (2002), Miles and Huberman (1994) and Eisenhardt (1989), we divided the data analysis stage into three distinct stages, namely, (1) coding, (2) within-case analysis, and (3) cross-case analysis. Next, the strategies that we used to analyze data (Langley 1999; Patton 2002), associated with each of the last two stages, are examined.

4.3.1 Coding

In the early stage of data analysis, the challenge laid in making sense of huge amounts of data by "reducing the volume of raw information, sifting trivia from significance, identifying significant patterns, and constructing a framework for communicating the essence of what the data reveal" (Patton 2002: p. 432). This activity is called coding. A coding scheme represents a key data management tool for researchers and is used to organize segments of similar or related text for ease in interpretation and to search for confirming/disconfirming evidence of these interpretations (Miles and Huberman 1994). However, there are no rules for analyzing qualitative data, only guidelines that need to be applied with "judgment and creativity" (Patton 2002: p.433).

The coding of qualitative data entails assigning unique labels to text passages containing references to specific categories of information (Miles and Huberman 1994). The coding process started in phase 1 by creating a provisional "start list" of codes prior to the interviews. Most of the initial coding categories were drawn from the conceptual framework and the list of questions. In phase 2, the interview transcripts

were introduced into a database, read carefully and relevant portions highlighted. The highlighted portions were then keyed into the database into a field called "evidence" as chunks of rich text. All of the transcripts, starting with the first interview, were coded using the preliminary set of codes. Occasionally, a segment of the transcript resulted in the creation of a new code, or the refinement of an existing code or even the amalgamation of codes with similar meaning. The coding scheme is presented in Appendix G.

The development of the coding scheme was an on-going process throughout the transcription of each of the cases. In fact, the formal cataloguing of "instances" into conceptual codes and categories was undertaken concurrently while the data were being collected and entered into the database. Twenty-three resulting codes within eleven major categories emerged from the analysis of the cases. The goal of the coding was to identify patterns. Usually a pattern, in collected interview data, "at minimum describes and organizes the possible observations and at maximum interprets aspects of the phenomenon" (Boyatzis 1998: p.4). Patterns may be generated inductively from raw interview data or generated deductively from theory or prior research (Patton 2002). We chose the latter approach, which is specific to analytic induction. We follow to Patton's (2002) two-stage analytic induction: first, we selected and coded pieces of texts (mostly from the transcripts of interviews, meeting minutes and emails from the project group members) and then we analyzed the resulting data to determine whether the findings support our three research propositions (P1, P2 and P3). Second, we inductively revisited the case data to determine if additional theoretical insights could be unearthed. Then, we continued with a cross-case analysis, investigating similarities and differences between the cases, first in terms of support for, or lack thereof, the propositions and second in terms of the new insights gained during the inductive analysis. From this we developed new propositions.

4.3.2 Within-case Analysis

This first type of analysis focused on describing the events experienced by the respondents that allowed unique patterns of each case to emerge. These patterns provided us with a rich understanding of each case. For this analysis we used a temporal bracketing strategy (Langley 1999). This strategy entails dividing the ISD

process into different broad-range phases; with every period having certain continuity in its activities and discontinuity to adjacent periods (Langley 1999; Poole and Van de Ven 2004). We identified and constructed the different temporal brackets based on either practices of knowledge sharing, strategic actions or decisions taken by actors or by contextual events. That is, each temporal phase started either by a significant exogenous event or an endogenous action or a decision taken by a project team member or by a decision-maker. We created these temporal brackets by using table grids, with columns reflecting how team members have lumped events together. These grids were used to decompress events into "a series of discrete but connected blocks" (Langley 1999: p. 703).

The temporal bracketing strategy for analyzing process data enabled a comparative analysis between the phases; which in turn shed light on the gradually evolving changes within each case (c.f. Barley 1986, for a study that uses a similar approach). The outcomes of this analysis constituted the logical chains of evidence. The resulting chains of evidence permitted an explanation-building analytic strategy (Yin 2003). Table IX summarizes the strategies used to analyze process data in this study.

Table IX   Process Data Analysis

Type of Analysis	Process data analysis strategy	How the strategy was used?
Within-case	Temporal bracketing (Langley 1999)	Created grids from previous dimensions and influences from literature (rows) combined with how actors combined events. Grids were filled in with pertinent events and in-depth recounting of an event.
Cross-case	Analytic induction (Patton 2002; Lapointe and Rivard 2005)	Based on previously developed propositions, we tried to identify similarities and differences between the three cases.

4.3.3 Cross-case Analysis

Using analytic induction, we looked for the presence of common patterns and unique characteristics. Analytic induction was based on researchers' theory-derived propositions and represented an alternative to the traditional phenomenological inquiry and grounded theory (Patton 2002). In analytic induction, researchers develop propositions prior to data collection. These propositions are usually based on hunches

and extant theory, and are revised during data collection and analysis to "fit emerging interpretations of the data" (Gilgun 1995: p.268). For example, Lapointe and Rivard (2005) used this method to analyze process data in their multi-case study of clinical IS implementations in hospital settings. This analytical approach enabled them to identify emergent temporal patterns of IT resistance and to advance a process model that illustrates the dynamics of the resistance to IT implementation.

Cross-case analysis was conducted by using methods suggested by Eisenhardt (1989) that enhanced the probability of capturing new findings among the data. First, we looked for the presence of categories across multiple cases that helped us to identify whether similar patterns emerge in multiple settings. Second, cases were compared in pairs to identify similarities and differences between them. Charts and tables were used to facilitate comparisons between cases and the analysis process was iterative.

4.4 Research Quality

Trustworthiness of the quality of the research should be considered an important issue at the stages of data collection and analysis (Lincoln and Guba 1985). But all depends on the criteria used to judge the research quality. However, "every way of seeing is also a way of not seeing" (Silverman 2000: p.825). Different approaches to qualitative inquiry are based on different epistemologies and ontologies (Patton 2002). While positivists link the quality of their work to reliability, internal validity and generalizability, social constructivists rely on confirmability, credibility and transferability as criteria for evaluating their research conclusions. Due to the fact that our worldview is pragmatic, we adopted Miles and Huberman's (1994) framework for evaluating the quality of the conclusions of the qualitative inquiry. The framework is not based on a specific paradigm but rather on a generic set of criteria that allows different viewpoints to coexist. The framework is based on five qualitative inquiry elements:

- *Objectivity/Confirmability* – This criterion addresses the question of whether conclusions depend on the subjects and settings of inquiry, rather than on the researcher (Guba and Lincoln 1985). The issue here is related to the definition of the relative neutrality of the inquirer. This criterion is important in our case due to

the fact that the researcher was an "insider" of the organization. Insider research is defined as qualitative inquiry performed by members of organizational systems and communities in and on their organizations, in contrast to research that is conducted by researchers who temporarily join an organization for the purposes and the duration of the study (Adler and Adler 1987). Another definition, provided by Alvesson (2003), albeit about a different type of qualitative inquiry (self-ethnography) than ours, provides a clear image similar to our understanding of what the insider research entails: "a self-ethnography is a study and a text in which the researcher-author describes cultural settings to which s/he has a "natural access", is an active participant, more or less on equal terms with other participants. The researcher then works and/or lives in the setting and then uses the experiences, knowledge and access to empirical material for research purposes" (p.174). Insider research provides rich empirical accounts about what organizations are really like, which traditional approaches may not be able to uncover. An important challenge awaits the researcher who wants to pursue this approach: how to avoid "staying native", or how to keep an open mind and try to escape "the tribe's shared cultural frame" (Alvesson 2003: p.189). When the research site is also the researcher's employer, care must be taken to identify and isolate the researcher's bias (Lincoln and Guba 1985). Thus, in this study we tried to be self-aware about personal assumptions, values and biases.

- *Reliability/Dependability* – This criterion was used to assess the clarity of the definitions of the analytical constructs, research questions, and table grids to represent the temporal brackets. It also evaluated the appropriateness of the sampling decisions and the overall design (Miles and Huberman 1994).

- *Internal Validity/Credibility* – This criterion evaluates the credibility of the findings to the subjects and to the readers. The most common approach to increase internal validity is to use data triangulation (Eisenhardt 1989). The use of multiple methods – triangulation – is often recommended in order to create a richer picture. We were aware that using only two sources of data collection in our study would constitute weak internal validity. To mitigate this problem we used meeting minutes and informal conversations with other members of each of the three projects that were not interviewed, to triangulate some of the interviewees' statements.

- *Generalizability/Transferability* – This criterion addressed the question of whether the conclusions of the study are transferable to other contexts (Lincoln and Guba 1985). Our qualitative inquiry aimed at a generalizability of the conclusions from empirical statements to theoretical statements (concepts, theory, and rich insight) (Lee and Baskerville 2003). Thus, developing a process theory from case studies fits this perspective on the generalizability of the qualitative inquiry results.

- *Utilization/Application* – In our pragmatic perspective this criterion led to "the question of what one can do with qualitative findings" (Patton 2002: p.581) or to the question of "pragmatic validity" (Kvale 1989). From this viewpoint our study sought to shed light on the post-merger organizational dilemma: how much to integrate and how much to grant autonomy.

The above criteria were kept in mind as our empirical work advanced. They do not represent "rules to be stiffly applied" (Miles and Huberman 1994: p.278), but guidelines and questions that we needed to ask ourselves when we assessed the quality of our work.

4.5 Ethical Considerations

Ethical considerations are an intrinsic part of the research design. Because the nature of qualitative inquiry requires interaction with individuals and groups, certain ethical issues may arise. Miles and Huberman (1994) identify several issues that we took into consideration consider when we collected and analyzed data and presented conclusions.

- We asked all the participants to read and sign an informed consent that ensured interviewee's privacy, confidentiality, and anonymity will be respected.

- We engaged in our research by respecting reasonable set of standards, such as avoiding undisclosed conflicts of interest, inappropriate citations, and sloppy data recording.

The unique situation of an individual being at the same time a researcher and an employee of the organization under study, on one hand may resolve some of the difficult ethical implications an external researcher is facing. In this situation the researcher is bound by specific confidentiality agreements especially in hospital settings

when most of the "insiders" can access sensitive patient related information. On the other hand, access to data by "insider" researchers might be perceived as a conflict of interest. This last issue posed considerable challenges to the "insider" researcher who found himself caught between loyalty tugs, behavioral claims, and organizational identification dilemmas (Stephenson and Greer 1981). In this regard, as mentioned earlier, we chose ISD projects where we had not been involved.

In sum, as an "insider" researcher, through a process of reflexivity, we were aware of the strengths and limitations of our understanding of organizational dynamics and of our own organizational lived experience so we could use our theoretical knowledge to reposition our understanding of the settings to which we were close.

Next chapter is dedicated to the results. We present the outcomes of the within-case data analyses and then the cross-case analysis.

CHAPTER 5: Results

In this chapter, we will present for each case the key fields of practice that were identified from the data, the level of complexity of the knowledge at the boundaries between fields and the relative positions that agents occupied within these fields. We will then assess the relationships between knowledge sharing practices and the resulting PMI approach and IS functionality.

In this chapter, we analysed the knowledge sharing practices across the merging organizational fields within the THC during three ISD projects using a practice perspective to understand: 1) How do agents from merging organizations, engaged in an IS development during PMI, share knowledge of the work practices required by a specific PMI approach?; and 2) How does agents' understanding of the work practices of the others engaged in knowledge sharing during IS development in PMI, influence the resulting IS functionality?

Our data analysis strategy followed Patton's (2002) two-stage analytic induction: we started by deductively analyzing the resulting data for each case from case narratives, interviews and archival documentation to determine whether the findings support our three research propositions. Second, we performed an inductive analysis by revisiting each case data to determine if additional theoretical insights could be found. Then, we finished with a cross-case analysis. Next, we describe our approach for the deductive and inductive analyses.

5.1 Deductive and Inductive Analyses - Approach

5.1.1 Deductive Analysis

The purpose of this analysis was to assess the empirical material in relation to our conceptual framework, specifically the three main research propositions. First, we tried to identify, at the organizational level, if there was a relationship between the planned PMI approach and the level of complexity of the knowledge at the boundaries. To achieve this, we espoused a *knowledge-in-practice* perspective in which knowledge is considered to be "localized, embedded and invested in practice" (Carlile 2002: p.442) and encompasses two complementary epistemologies: an epistemology of possession

and an epistemology of practice, that advances the concept of *knowing* – "something that is a part of action" (Cook and Brown 1999: p.387). *Knowing*, in the case of a healthcare provider engaging in practices of management of patient information, constitutes the actual act of accessing and manipulating the information vital to providing quality healthcare services.

Then, at the ISD level, we sought to understand if and how the actions of different boundary spanners, based on their individual status, might affect the final configuration of the ISs developed and implemented in each of the three cases.

Finally we looked at the resulting IS functionality and the IS post-implementation practices across the boundaries of the fields of practice in order to understand whether the process of IS development at the ISD level had any impact on the PMI approach at the organizational level.

5.1.2 Inductive Analysis

The primary purpose of the inductive approach was to allow new findings to emerge from the raw data. Thus, we revisited the case data, especially the content of the interviews, and we sought recurring themes that were not taken into consideration by the three main research propositions. The inductive coding was based on the consideration of the existence of multiple meanings that were inherent in the text of the transcribed interviews. We then identified text segments that contained meaning units, and created a label for a new category into which the text segment was assigned. Additional text segments were added to the category where they were relevant. Two themes emerged:

The first theme refers to symbolic language used by interviewees when describing their or other agents' membership to a specific THC site. By using words like "we", "us" and "they", the interviewees made a clear delineation between the existing different fields of practice.

The second theme is based on the concepts of organizational culture and identity, two concepts that were used by interviewees when defining site-based norms, values and practices. These concepts are the subject of an extensive body of literature on organization studies but are usually not used by practice theorists. However, during

the process of coding, we wondered whether these two concepts might provide new understandings of how the agents positioned themselves within their field of practices.

Next, we present an overview of the planned PMI approach at the THC followed by the three within-case data analyses and the cross-case analysis. The structure of the case analyses is illustrated in Table X.

Table X Case Analyses Structure

Within-Case Analysis (each of the 3 cases)	Case Narrative • General Context • Main Stakeholders (Project team composition) • Temporal Bracketed Phases of the ISD process
	Deductive Analysis – assessment of the 3 research propositions based on the chain of evidence
	Inductive Analysis – emergence of new themes
Cross-Case Analysis	Deductive and Inductive Analyses; Proposal of new propositions

5.2 Overview of the Planned Post-merger Integration Approach at the THC

The Teaching Health Centre (THC) is one of the most comprehensive university health centres in North America and is the result of a merger of equals. The merger represents the initiative of five teaching hospitals affiliated with the Faculty of Medicine of the local University: the Downtown hospital, the Midtown hospital, the Paediatric hospital, the Specialty 1 hospital, and the Specialty 2 hospital. Their goal is to provide 21st century healthcare in a new and efficient environment adapted to the changing needs of patients. In several THC strategic and operational documents the five hospitals[10] are sometimes referred to as "Paediatric site", in reference to the Paediatric hospital and "Adult sites" in reference to the others. This clear differentiation is noteworthy for our analysis of the 3 cases.

The THC IS department has its origins in the Systems Coordination Unit (SCU), created in 1985 (12 years prior to the merger) by the Faculty of Medicine board of directors as a non-profit organization affiliated with the Faculty to manage the newly acquired Patient Care System that was supposed to be jointly implemented at the

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[10] We adopt the terminology used in the official documents of the THC – the term "site" is used interchangeable with "hospital" when describing the healthcare institutions members of the THC.

Midtown and the Downtown hospitals. This arrangement was considered a necessity to centrally manage the IS at the two hospitals that, although being independent, were using the same patient care application. Prior to the merger, on paper, the SCU appeared as a separate entity, while in reality the unit's employees were a mix of IS technicians that were hospital-based and a number of application developers and managers that were involved in the development and management of the two hospitals' common systems. In 1998, one year after the merger, the Paediatric IS team was merged with the SCU and the new THC IS department emerged.

In 1997, during the merger decision phase, THC management committed to introduce new standards of practice or "best practices" in their document on the strategic vision for the future merged institution to provide modern healthcare to their patient community (Patient Services Steering Committee Report 1997). In the view of the new management, these new practices would be enabled by new ISs that would be adapted to the new integrated work processes (THC IS Strategic Plan 1999).

According to the Patient Services Steering Committee Report (1997), the merger's motivation was three-fold:

1) To provide "21st century health care in a new, efficient, caring environment" (p.4) for patients of all ages by building on the tradition of medical leadership of the founding hospitals;

2) To shape the course of academic medicine by attracting clinical and research competencies from around the world;

3) To be in a better position to prepare the next generation of medical professionals.

In order to achieve these goals, the post-merger organization would "require transformation with a single objective – to build a flexible model for delivering health care based on a continuum of services organized around patients' needs" (Patient Services Steering Committee Report 1997: p.3).

The report made several recommendations on how to attain the merger's goals.

- The new healthcare centre needed to establish standards of practice, develop a common set of guidelines, and use common medical terminology, assessment tools and outcome measures.

- Upper management should develop a plan to prepare all THC administrative and clinical staff to work within changing models of care.

- A clear and detailed communication plan must be implemented to facilitate and guide the integration of "the organizational cultures across the current sites" (p.56).

- The final stage of the integration of clinical and administrative programs and departments should be attained when the THC moves to a unique new facility within the next 10 years.

During the pre-merger planning of the future THC, management realized that IS function would have a major role during the PMI phase. In an effort to provide direction for improving IT resources and technology support to the new organization, an IS Steering Committee was created to propose an IS Strategic plan. The plan was based on three main recommendations made by the THC board of directors.

First, the development of IT on all THC sites had to be consistent with the overall merger objectives. Second, "because of the expected magnitude of the process redesign" (THC IS Strategic Plan 1999: p.38), keeping legacy systems in use was considered to be an ineffective cost option. The implementation of new work practices could only be accomplished with a single set of information systems. In the pre-merger context, the THC hospitals developed their own sets of applications, both for the clinico-administrative and administrative application portfolios. Two technological platforms were used for site-specific systems. One was used by the Paediatric site and the second, by the Adult sites. Also, each site had its own medical patient index (MPI) and patient ID card, used several and separate patient scheduling systems, managed beds and emergency rooms according to the internal site perspective, operated its own and distinct order entry and result reporting system and produced statistics specific to the patient stays within the specific sites. The site-specific approach was also present for the functionality of the IS providing clinical and volume data such as ambulatory patient scheduling, pharmacy, labs, radiology, operating rooms, etc. According to the IS Strategic Plan, the post-merger application portfolio needed to adapt to a seamless integrated organization that would result from the redesign of the business processes. The patients would have a single number and ID card linked to a single record number used by all THC sites. Third, the THC was committed to offering a better quality of IS by using a "best-of-breed" approach for clinico-administrative, administrative, clinical

systems, and infrastructure. These ISs must be configurable to provide clinical data and/or operating volumes that are adapted to the new integrated THC processes. Thus, in 1999 the IS Steering Committee identified a list of prioritized integration projects and among them were an enterprise solution for the ambulatory care patient scheduling, the integration of the laboratory services across the five sites, and a Clinical Information System (CIS).

In summary, according to the archive strategic documentation, the planned THC PMI approach was consistent with a *transformation* approach at the outset of the PMI phase. As mentioned in an earlier chapter, in a PMI transformation approach, firms are integrated by developing totally new, yet common, practices and other organizational attributes (Marks and Mirvis 2001). According to Ellis (2004), organizations that pursue a PMI transformation approach establish pre-merger formal transition management structures and concrete blueprints of the PMI process. The THC upper management created steering committees and task forces and prepared a concrete blueprint of the PMI process that included the design plans of a new facility and the identification of post-merger critical issues (e.g. success factors, employee communication, best practices, cultural differences).

5.3 Within-Case Analysis: CASE 1 – The Ambulatory Appointment Information System (AAIS)

5.3.1 General Context and Main Project Stakeholders

Even before merger discussions started the Paediatric site had expressed their need for a new ambulatory appointment information system (AAIS). Ambulatory care represents any medical care delivered on an *outpatient* basis. Many medical conditions do not require hospital admission. Most medical investigations can be performed on an ambulatory basis, including blood tests, X-rays, endoscopy and even biopsy procedures of superficial organs. An AAIS, as an advanced patient scheduling information management system, enables clinical staff to manage a wide array of ambulatory care information, including appointments, registrations, attendances and waiting lists. The key functions of an AAIS include: real-time appointment coordination based on the availability of the healthcare providers; efficient appointment management based on

information gathered during recent visits; systematic appointment scheduling – waiting lists, appointment confirmations, and patient attendance and preferences; efficient resource management; up-to-date patient histories; advanced scheduling time conflict checking; statistical information – volume of activity, clinical cancellation, and patient load by healthcare provider.

Prior to the merger, the Paediatric ambulatory services were using a mainframe-based antiquated system that was not able to provide adequate appointment booking and patient related statistics to management. At the other THC sites, some ambulatory clinics were using basic DOS-based booking systems, whereas others were still using paper and pencil. Most of the problems associated with those approaches when managing ambulatory appointments were: incapacity to manage patient flow (e.g. too many new patients scheduled resulting in delays); no automatic coordination of appointments; impossibility to create an appropriate appointment structure; unavailability of useful statistics related to diagnoses, type of visits, type of patients, procedures; difficulty for the hospitals' Ambulatory Services Committees to implement their policies because of lack of information (e.g. clinic cancellation reports were unavailable).

Prologue. During the pre-merger phase, a collaborative agreement was signed between the future THC and the AAIS vendor (hereafter called Omega), to develop an Oracle-based application for ambulatory services appointment scheduling. A project team was created to analyze the needs of the ambulatory services of all the future THC sites involved in the joint venture and to supervise the work of the developers from Omega (email from the IS Director, December 4, 1996).

As illustrated in Figure 3, we have broken down the more than 6 years of development and parallel implementation of the AAIS into three bracketed phases: Phase I (1997-1998) - the initial development of a prototype based on the needs analysis performed by the project team members; Phase II (1998-1999) – Beta testing and implementation at the Paediatric site; and Phase III (2000-2003) – second version was developed, tested and implemented at the Adult sites. The bracketed project timeline is illustrated in Figure 3. The AAIS development project team consisted of, in the first two phases, three clinic administrators, one from each of the two main adult

sites and one from the Paediatric site. For Phase III, while the Paediatric site was not represented any more, three IS professionals were added to the team. The AAIS development team composition is shown in Table XI.

Table XI AAIS Project Team Composition

Project Phases	Function at the outset of the project	How they are referred in the text	Site	Background
Phases I, II & III	Ambulatory Services Manager	Midtown-Manager	Midtown	Started 1988 as a clerk in one of the clinics; Manager of different outpatient clinics; Math and computer science bachelor
	Ambulatory Services Manager	Downtown-Manager	Downtown & the two Specialty sites	Worked in various clerk positions in different clinics within the Downtown hospital since 1986; bachelor degree
Phase I & II only	Ambulatory Services Manager	Paediatric-manager	Paediatric	Started in 1993 as project manager; bachelor degree
Phase III only	IS Project manager	IS-Manager	THC	Over 20 years in the IT industry; 10 years of IT project management; College degree in IT; hired in 2000
	IS Specialist	IS-Specialist1	THC	Nurse and Computer technician background; hired in 1998
	IS Specialist	IS-Specialist2	THC	Worked in a bank before being hired by the THC; Masters degree in education; hired in 2001

Figure 3 Flowchart of the Bracketed Project Timeline

Management Actions

| Poor communication plan of the PMI approach - THC | Clear communication plan at the Paediatric site | Start planning the implementation at the Adult sites | PR to "sell" the system to the user community | Imposes deadline for adoption |

1st prototype released

2 major updates

Increased user resistance

| Needs analysis | 1st design on paper | Iterations of the prototype | Beta version | Continuous development of the Beta version while implementing across clinics at Paediatric site | Eval and start redesign | Beta version | Testing Beta clinics | Continuous configuration process and Implementation |

ISD Process

— Jan. 1997 — Spring. 1997 — Spring. 1998 ———— May1998 ———————— End 1999 — Spring 2000 ——— Spring 2001 — End 2001 ——————— July 2003

Phase I: Early Development   **Phase II: Testing and Implementation at the Paediatric Site**   **Phase III: Testing and Implementation at the Adult Sites**

5.3.2 Phase I: Early Development of the AAIS - The Emergence of Different Fields of Practice and Challenges for Knowledge Sharing (1997-1998)

At the initiative of the newly created Directors Committee in charge of the planning of the merger, the AAIS project commenced in January 1997. In this phase the members of the project team were the three managers of the ambulatory services at their sites (Downtown, Midtown and Paediatric), each using a different set of ambulatory practices:

> "I would say fairly different. There were a lot of procedural differences in terms of how the clerical tasks were done, different forms were being used, [and] different billing practices were in place. It was, you know, from an administrative support standpoint there was a significant amount of difference between the sites" (Midtown-manager)
>
> "They [adult sites] had different ways of functioning…" (Paediatric-manager)

The three managers, members of the project team were well-appreciated professionals within their own site and had accumulated a significant amount of knowledge regarding the management of the ambulatory services in their respective hospitals.

> "[The Paediatric-manager], as I said very quickly took on a leadership role in terms of coordinating the flow of information from the hospital side. We all respected the hell out of her for the job that she was doing, she was really doing a great job. [Downtown-manager] was always in there advocating for her clerks and you know trying to make the software as effective and efficient for the clerks as humanly possible" (Midtown-manager)
>
> "[The Midtown-manager] had a very solid informatics and you know, programming experience, structure of, you know, how things worked. So he was very good at, you know, arguing if you want the pros and cons of certain functionality and, and why it should be done that way" (Paediatric-manager)

From the outset of the project, the three team members were not aware of significant differences between their practices due to the fact that they never had to interact before. Also, while the project team members were aware that they must rely on the others to come up with a system that would accommodate the needs of all three sites, they didn't know how much they would be dependent on the others.

> "In the first three months, that knowledge transfer in terms of how they [the other sites] do it versus how we [Midtown site] do it, it was a very novel thing because you tend to think the way you do things is the entire universe right and so it's been a wakeup call to discover that there are all kinds of different ways of approaching the same process, the same basic function" (Midtown-manager)

The ISD team members realized that not only had they never met before, but they also had never been involved in the development of a similar IS. Even though officially employees of the THC, the fact that they were coming from different hospitals and now

were supposed to share knowledge and develop a common system is clearly suggested by two of the ambulatory managers:

> "So it took us a little while to do that because, you know, there was a group of people that had never met each other before or by and large so figuring out a way to work together was initially I guess a bit of a challenge […] As far as the [Paediatric], as far as I am concerned at the adult sites, the [Paediatric] is a black box. I know a little bit because I take my children there when they are sick, that's it" (Midtown-manager)

> "Actually we didn't know each other. We had never met. I met [Midtown-manager] there, I had never met him before, I didn't know… actually I wasn't even aware of, you know, who was in charge of ambulatory [services] outside of the [Paediatric]. I think we were still at that time very site-specific… You didn't think of yourself as [THC]. You thought of yourself as, I'm site specific" (Paediatric-manager)

The complexity of the contextual nature of the project was enhanced by the fact that upper management didn't clearly present the new AAIS as being a future unique configurable IS for the ambulatory services at the THC to the user community within the ambulatory clinics. This is illustrated by the following comments:

> "There wasn't enough support from senior levels. The message was not given appropriately that this is an enterprise-wide, mandatory activity" (Downtown-manager)

The ambulatory services managers were aware, at the outset of the project, of the fact that the outpatient clinics' staff was not ready for change and that the upper management didn't try to "sell" the potential benefits of the new system. This had created a negative impression especially on the physicians, illustrated in the following statement from one of the interviewees:

> "You always get politics in there. People using it were not that thrilled about using it but it's always, you know, some people like it, others didn't […] At the adult sites it was like, certain doctors didn't want to have the system, they have a different kind of environment, so it wasn't you take one system and you replace with another because they didn't have one system." (Paediatric-manager)

During this early stage of the development, the team members would sit in weekly meetings that were all day affairs. During these meetings they were trying to give the developers an idea of how they wanted the system to function. In this context, team members had to initially start a process of knowledge sharing where common ground would be established to be able to start an efficient collaboration and propose a first configuration of the new IS. During these meetings the individuals would use unstructured documentation and would do follow-ups by email.

> "The advantage [of the meetings] was that there were other representatives from other hospitals. And the fact that they also had Lotus notes it made it very easy to communicate like that […] In that we would see things and draw things on the board,

drill it down. We had more of a visual of what things would look like" (Downtown-manager)

From the outset, teamwork was organized on a peer-based collaboration without a formal project manager from the user side (there was a designated project manager from Omega, who never participated in the team meetings). However, soon they realized that they needed a person to make follow-ups after each meeting and be a liaison with the Omega programmers. The Paediatric-manager, considered herself as a leader from the outset and found it normal that she took the lead of the IS development process across the boundaries between the three fields of practice. In fact, the idea of the new system was put forth by her hospital and she already had a good idea of how the new system would make the Paediatric clinics more efficient. The other team members adopted her immediately as a leader as they found her charismatic, experienced and respected in her work community. Retrospectively, the Paediatric-manager saw herself, in the context of the project, as being "the spearhead … the catalyst… the person that is the glue that holds this together and gives direction, keeps people on track".

The first milestone of the project was considered to be when the group was able to provide the Omega developers with a good initial conceptual document that made sense to all three clinic managers. This document constituted the first reference for developing the first version of the configuration of the new system.

> "They [Omega developers] initially were working basically off of screen shots. They would show us screen shots and as we were going along so we didn't really get to see a prototype that we could actually play with until fairly late in the process, but at the earlier stages they would show us the screen and they would say you know as a user interface do you think, you know if you click on this it will do that… it's basically like giving you pictures of the prototype and you're saying you know when you click on this button it will bring you to this screen and then they will give us another sheet of paper" (Midtown-manager)

The group meetings continued and the members were sending updates of their initial blueprint to the Omega developers. Shortly thereafter, the developers provided a first prototype of the system that was lab tested by the project team members. Following the test, all three team members recognized that their meetings were about exchanging clear information about the needs of their own communities of practice, in order to effectively negotiate and convince the others around the table of the necessity of their demands for specific system features. Some issues were easily solved by an immediate consensus, while others needed more explanation and persuasion based on

trade-offs. Thus, during this period, the team members were going back to their sites and consulting with key players in the clinics to make sure that the system that they were trying to put together was in fact reflective of what the clinics' needs were. This is reflected by the comments of one of the managers:

> "We were all doing it from the perspective of our experience and we were all doing it in order to try to ensure that our populations that we were representing were getting the best products possible […] There were several occasions where we didn't agree as a group on what we should do and all of us were trying to convince the others that ours was the best way to go" (Midtown-manager)

The outcomes of these discussions were more often than not a compromise of some sort mainly representing the result of various claims of legitimate knowledge and know-how made the Paediatric-manager on which she justified the courses of action she took:

> "I'm an IS, that's my field of competence, so I'm an IS person so it's very easy to talk to a programmer because I know what they are looking for, type of thing. And I can turn around and talk to the user because I can adjust the language" (Paediatric-manager)

In the spring of 1998, after more than a year of system development and several versions and patches later, Omega decided that they had a sound prototype of the new system that they would like to implement in a Beta site. The members of the project team felt that the decision was a bit premature, but they realized that their users would never make up their minds with regard to the final configuration of the system. However, they knew that along the process of Beta testing and hospital-wide implementation the configurable system would need to be "tweaked" many times to become flexible enough to accommodate all the future users. Due to the fact that THC upper management considered the project to be the initiative of the Paediatric site and that its user community was informed of the upcoming changes through an efficient communication plan, the THC granted the Beta site to the Paediatric in May 1998.

5.3.3 Phase II: The Struggle to Keep the Old Practices - Beta test and Implementation at the Paediatric Site (1998-1999)

From the outset, the Paediatric-manager told the user community at the Paediatric site that the features of the new appointment system would be compatible with the norms and procedures in place. A clear communication plan was put in place by hospital management where it was stated that the clinics must switch to the new IS.

During the implementation, the Paediatric-manager would provide feedback to the rest of the team members from the various clinics where the new system was being implemented and would make recommendations on how to adjust/modify the system's functionality. At this point there were no more major changes to the system design. However, some minor changes considered important by the end users, for instance, screen configuration changes were implemented in an effort to accommodate special requirements of some of the Paediatric clinics staff.

In some rare instances, the Paediatric-manager used her reputation, strengthened during Phase I, to unilaterally decide on an issue. For example when she asked for a specific modular interface to be built into the system, the Downtown-manger didn't understand its utility for her site's clinics. The Paediatric-manager notes that she tried to argument her need but to no avail:

> "[Downtown-manager] wouldn't let go. She couldn't understand why we needed that, and at one point it was like, look, I'm going to get it for the [Paediatric], whether you understand or not, I'm getting it" (Paediatric-manager).

In her opinion, the Paediatric-manager took over the leadership role due to the fact that the Paediatric site was the institution that, prior to the merger, had embarked in a need analysis for a new AAIS. She notes that:

> "I have to say, we probably, we being the [Paediatric], probably influenced a lot because the whole project actually came from a needs analysis that we had submitted. And in there we actually had designs of screens, I mean, so, this wasn't started from scratch, from a blank page I mean. There was always an idea, you know, put on the table that had to be discussed. So there were certain things that were sort of put on the table and very early on were discussed to say OK, is this what we want to agree as a group" (Paediatric-manager)

Also, there were specific procedures needed by the Paediatric site such as, an enforced patient data confidentiality feature and maintaining a list of people who wanted to have earlier appointments.

> "You have convictions about the way certain things should function or not. For example, confidentiality of information is a big topic… We had long discussions about how far we could go in the system. For example, I'm calling, I'm in the middle of a divorce, 'I don't want my husband to know my phone number'. So the big question is how do you block that information, are you able to flag it? Should you put it confidential? So obviously for us in Paediatric it's a huge issue because we deal a lot with patients, we deal more and more with that kind of situation. On the adult side, not so much." (Paediatric-manager)

These requests were put on the table on a regular basis by the Paediatric-manager based on the fact that she was convinced that due to its procedural and clinical differences, the Paediatric site would never really be integrated with the rest of the

THC. On one hand, the Paediatric-manager thought that the Paediatric site should keep its clinical practice independence, while the main administrative functions, such as Finance and HR would be fully integrated in the structures of the THC. Paediatric-manager was convinced that the development of the new AAIS had more to do with implementing a system that would make the management of the ambulatory services more efficient, than with the merger.

> "I'm pretty sure they [Adult sites] don't really care what system we have due to the fact that the Paediatric clinics don't need to communicate any patient data with the clinics on the Adult side of the THC." (Paediatric-manager)

On the other hand the managers from the Adult sites realized from the outset that the AAIS was a system that needed to reflect the future reality of THC. As noted by two interviewees:

> "The merger had to play a part of it because at that point it was clear that the five hospitals were coming together. We had a bunch of 'rinky dinky' little systems that were often DOS-based and clearly we weren't going to get what we needed out of them. It was clear that this was a requirement that we had to have some kind of a common system" (Midtown-manager).

> "Because of the physicians I have never been able to standardize anything. So if you work in Clinic A on Monday and you're well trained and you know I have stamped this paper, this paper, two labels and a Medicare. Tomorrow they shove me in another clinic, I have no idea because that doctor, he wants three labels, the Medicare instead of putting it like this, it should be like this. Everyone wants their own way and it's physician driven" (Downtown-manager)

The implementation of the new AAIS was finalized at the Paediatric site at the end of 1999.

5.3.3 Phase III: Challenges in Applying the Planned PMI Approach – AAIS Development and Implementation at the Adult Sites (2000-2003)

Once the Y2K scare had vanished in early 2000, the THC upper management realized that after almost two years of post-merger integration, while the main administrative functions such as Finance, HR, Payroll, and Purchasing were fully integrated, the clinical and clinico-administrative services were integrated only on paper. The reality was that the Paediatric site had kept their clinical independence and within the Adult sites, with some notable exceptions like the Radiology and the Emergency departments, the healthcare providers and their administrative staff were preserving their old practices, norms and site-based cultures. Thus the three main sets of practices were still present. This situation is noted by one of the interviewees:

"I think because the environment was, from what I understood, so different they were better off with starting from scratch to make new, maybe it would have involved incorporating some little bits from others." (IS-Specialist2)

In this context, THC upper management realized that in order to successfully implement a unique set of clinical practices, they had to develop and deploy a multi-site version of the AAIS at the Adult sites as a first step in this direction. The THC also believed that a coherent communication plan would eventually increase the level of acceptance of the new system and practices. In 2001, in a public letter addressing the THC community, management enthusiastically presented the AAIS as being a hospital-wide information system that "was designed to meet the needs of very specialized clinics such as those found across the THC" and can be customized to optimize clinics' practices (THC IS Hard Copy, June 11, 2001). In a letter sent to the heads of departments, the fact is stressed that the new system represents a corporate system that would enable a new standard of practice and future users need moral support to face this important change (Letter addressed to the heads of departments, May 7, 2001).

The system was successfully deployed at the Paediatric site. However, several risk factors that could affect the outcomes of the project were identified. First, the configuration of the system didn't take into consideration the co-existence of multiple master patient indexes. In the version being used, the function of merging two medical records (one from each main Adult site) was not working properly. If implemented like that, it may have caused confusion and concerns among users regarding the reliability of the system. Second, the first phase of the project was the fruit of a collaborative user effort without any assistance from the THC IS department and the system deployment was restricted to only one site (Paediatric). This approach was deemed inappropriate for a much larger setting such as the four Adult sites. Third, the system that was installed at the Paediatric site was configured to mostly reflect practices of clinics in a *standalone* healthcare institution.

In spring of 2000, THC management decided to continue with the AAIS implementation at the Adult sites. However, the project team dynamics changed from how they were in Phase I and II. The Paediatric representative was not involved in the project anymore and there were three new team members: an IS project manager (IS-manager) and two IS professionals (IS-Specialist1 and IS-Specialist) were hired and

assigned to the project. The two IS professionals, under IS-manager's supervision, were supposed to evaluate the existing version of the system, re-assess the clinics' needs in collaboration with the two Ambulatory Services managers from the Adult sites, and make recommendations to the Omega programmers on how to re-design the system to reflect a unique Adult multi-site ambulatory practices that upper management was trying to instill. At the same time they were in charge of organizing training sessions for the users and implementing the IS across the Adult sites.

The first impression that IS-Specialist1 had when she started to work for the project was that the two main Adult sites were still virtually distinct entities in terms of ambulatory practices. She remembers that when she started visiting the clinics with Midtown-manager and Downtown-manager she would hear all the time that:

> "You are implementing the system at the Midtown… you're implementing at the Downtown… well, we do things differently at the hospitals… you can't apply anything that you've applied anywhere else here. We need to be distinct… They don't really seem to consider themselves a part of the THC umbrella." (IS-Specialist1)

The IS-manager was expecting that the development and implementation of the AAIS at the Adult sites would be a huge challenge because it was the first THC PMI-related project and the application needed to be reconfigured to reflect the planned post-merger integration goals and the different organizational cultures at the Adult sites. As stated by the IS-manager:

> "For sure it was influenced by that [differences]. However, we had no choice. When you're trying to do something that is endogenous in cross-sites like that. It was extremely difficult" (IS-manager)

The challenge of Phase III of the AAIS development was represented, in one of IS specialists' view, by the project's lack of proper planning and documentation and by the dependence on the knowledge accumulated in the first two project phases by the two clinic managers:

> "AAIS came in really without a lot of direction from anywhere. It sort of appeared […] there was really no change management approach. No sort of work from the upper levels to disseminate and communicate to the lower levels… There was never really any push from the top to say, 'we have a system that we can bring you all together under one roof; we create your outpatient activity under a joint Downtown-Midtown sites. Things can be seen, you can share information'. The people that I was supposed to be getting guidance from were the Ambulatory Services Managers from the various sites. They really did not involve themselves in the project to the extent that I think was originally anticipated." (IS-Specialist1)

Half-way through the implementation, in early 2002, a progress report explains why the system is being received with such resistance from the clinics, which made the

development and implementation process advance very slowly: first, at the Downtown site where patient reservation practices in clinics were based on several DOS-based systems, users found the change to AAIS very difficult since the new system was a Windows- and mouse-based application; second, the organizational structure at the Downtown site was very different that the one at the Midtown site. Departments within the hospital pursued different practices; many of them were using their own charts and viewed switching to AAIS with its "corporate feel" as an obstacle to delivering efficient patient care. Department heads at both hospitals felt resentment at being "forced" to change departmental practices; finally, despite the fact that upper management attempted (letters to the department heads) to "sell" the new system to the professional communities across the sites a few times, a large number of clinic employees complained that they had not been properly informed about the changes the new system will bring to their practices (AAIS Progress Report, February 2002).

The first pilot clinics were chosen at the beginning of 2001 and the full implementation started at the end of 2001. During this time, the members of the team felt that they were wearing two hats. They were acting as negotiators and system developers at the same time. After they established common ground among themselves, the members of the project team had to "sell" the system to the potential users in the Adult sites clinics by negotiating common interests. The Midtown site representative remembers that,

> "I was definitively a salesman. There was no communication from senior management that there is a system coming down the road and it will be ready in a year… We were the first ones telling people that this was coming. We chose departments [clinics] where we would end up with more champions and power users who then would able to network with their people and, you know, talk up the system… However, it was a rough ride and we were never able to go into a department and say 'we're doing this, just leave me alone'. We had to meet with the doctors, convince them, then their secretaries, and then try it out […] I think I also had a bit of a – not a biased, but the fact that I was a clerk and I worked in the clinics, I had a very big understanding of their work life… Someone else may have needed to get more information, more knowledge" (Midtown-manager)

Second, the team members had to change their common knowledge base regarding the system by improvising ways of "tweaking" the system to do things that it was not originally designed for. One of the interviewees noted:

> "It was just you could take the system and you could just have people do with it what it was designed to do. Or you can get creative, work the system and morph it to give people more than what the system was designed to do" (IS-Specialist1)

The struggle to configure the system to accommodate most of the clinics' needs is illustrated in the following email sent by IS-Specialist1 to the rest of the ISD team:

> "Get lots of sleep tonight, and drink lots of coffee tomorrow morning! We need to be able to come up with a brilliant solution tomorrow. Any feedback, input, and brilliant ideas anyone else has to contribute will be greatly appreciated" (email from Specialist1, September 26, 2001)

For example, at the Infection Control clinic at the Midtown site, patients who were multi-drug resistant organism (MDO) positive needed to be identified prior to their visit and consulted in a different room from the regular patients. The two IS specialists had the idea to create a special field on the main application screen that would contain the names of these patients for future references. One of the interviewees remembers that:

> "So what you do is you create an appointment in the far future and so they will always be at the bottom of the list of the patients' appointment and we made the clinic name all capitals and greater than and less than signs to really make it stand out and so people know to look in this spot and see if there's an MDO. So you know that was an interesting, very non-standard use of AAIS to provide a service that we needed at the clinic." (Midtown-manager)

The team members were organizing formal and ad hoc meetings with the clerks and the heads of the departments where they were discussing clinic workflow and booking practices. After a visit to a clinic that needed a significant configuration change in the system, the members of the team would meet back in their offices and would create technical documents with the description of what needed to be changed / modified in the system functionality to accommodate the needs of that specific clinic. The documents were then sent to the Omega developers that would provide prototypes of the new version for testing in return. The team members were mainly communicating amongst themselves via email and telephone and had weekly meetings, coordinated by the IS-manager, to decide whether a specific clinic was ready for implementation and how to go about it.

In the spring of 2003, after close to three years of development and implementation, the enterprise version (Adult sites) of the AAIS was in use in about 90% of the clinics at the Adult sites. However, upper management came to the conclusion that despite the fact that the clinics drastically changed their practices in terms of site-based management of patient appointments, most of them were not using the inter-site functionality, which was considered as fundamental for the planned implementation of best practices. The AAIS was configured to automatically link patient

information from the two Adult sites, even though each patient had different medical record number at each site. Clerks were able to see all the appointments that were made across sites and all historical information was kept, to form what was called a "longitudinal record" for each patient. The new system, if used inter-site, was also able to create "performance statistics" for the Finance department.

Finally, this specific issue (not using inter-site functionality) forced upper management to impose the use of the system in the areas where it was not adopted yet and convince the other clinics to use the inter-site functionality. In an official public letter addressed to the THC community, the COO announced in March 2003 that "statistical reporting is a legal obligation and has an important impact on budgetary decision and allocations. As of July 1st 2003, the Finance department will be collecting all ambulatory patient statistics exclusively through the AAIS."

Epilogue. The efforts of the project team members over almost 7 years had finally brought to fruition the process of development and implementation of the AAIS. In 1997 the THC strategic plan was enouncing that one of the post-merger goals was to implement a common set of medical and administrative practices. However, at the end of Phase III, the THC ambulatory services were presenting two different sets of practice: one that preserved its old norms (Paediatric) and another, at the Adult sites, that can be described as work-in-progress best practices. While at the completion of the AAIS implementation in the summer of 2003 the Adult clinics practices looked more like a mix of old and new standards, the practices at the time of the interview process (Fall 2008) can be described as new standards along the strategic lines of the planned PMI approach. This situation is described by one of the interviewees:

> "With AAIS coming in so early in the merger, it was a big fight to get anyone to change their practice and to use this tool, this opportunity to work together as a unit. So in the long run, as the dust settled, the AAIS is pretty evolved, and became our enterprise booking system. Now I see changes in practices. I see more and more clinics from both sides looking and reviewing appointments for both Adult sites. It might also happen as a result of a momentum finally coming behind the fact that the THC is one entity." (IS-Specialist2)

5.3.4 Deductive Analysis

The new AAIS was implemented over a period of 6 years. The boundary spanners' actions and a series of trade-offs contributed to make the new IS reflect a

mix of preservation and transformation PMI approaches. A synthesis of the case analysis is presented in Table XII and the evidence is provided in Table XIII (Proposition 1), Table XIV (Proposition 2) and Table XV (Proposition 3). The analysis of the three Propositions was broken down by phase of the project in order to better understand the processual evolution of the boundary types and the PMI approaches.

Proposition 1: *The planned PMI approach will shape the nature of the knowledge boundary between the fields of practice concerned by an ISD, thus creating demands on the types of knowledge sharing processes and boundary objects that the agents involved in an ISD will require for adequate knowledge sharing, as well as on the role of the boundary spanners.*

An important element at the organizational level was that while it made it clear in high level strategic documents that the THC adopted a *transformation* PMI approach (e.g. Patient Services Steering Committee Report 1997), at the beginning of the project the upper management didn't present the new AAIS as being the first of the corporate ISs that would enable this approach to the user community. This caused confusion among the project team members and made them unsure of upper management's expectations from the new system.

> "There was no communication from senior management that this is coming." (Midtown-manager) "The message was not given appropriately that this is an enterprise-wide, mandatory activity." (Downtown-manager)

As documented in the case narrative and synthesized in Table XIII at the outset of Phase I there were three site-based fields of practice: the Midtown site, the Downtown site and the Paediatric site. At the beginning of Phase II only two fields of practice were identified: the Midtown and the Downtown. The evidence shows that at the outset of the project the agents were facing a high level of novelty that generated not only dependencies but also different interests between the team members. Differences between agents' knowledge about practices were important and a need for shared meanings was obvious. Due to a high level of knowledge complexity and the existence of different interests among agents, the nature of the knowledge boundary was pragmatic.

Table XII Case 1 Analysis

	Phase I	Phase II	Phase III
Fields of practice	P1: At the outset – *Three*: Downtown, Midtown and Paediatric <u>Inductive</u>: Site managers acknowledge and understand each site identity	P1: *Three*: Downtown, Midtown and Paediatric	P1: At the outset - Two: Downtown & Midtown; Outcome - Two: Adult sites and Paediatric <u>Inductive</u>: IS Professionals acknowledge but do not understand the organizational identity of the different fields of practice
Knowledge complexity	P1: *High level of complexity* - At the outset the agents were not able to correctly assess the differences in knowledge and the extent of the dependencies; high level of novelty		
Type of Knowledge Boundary faced by the agents	*Pragmatic boundary*: High level of novelty generated different interests between agents that impeded their ability to assess and share knowledge. Knowledge was invested in practice (each THC site had its own practices) and it was at "stake" for the main agents that possessed it.		
Knowledge Sharing (KS) process	P1: *Translation* (agents needed to establish shared meanings) followed by *Transformation* (need to develop common interests and trade-offs)	P1: *Transformation* (needed to develop common interests and trade-offs between Paediatric-manager and the Adult sites managers)	P1: *Translation* followed by *Transformation* (needed to develop common interests and trade-offs between team members and clinics' users)
Boundary Objects	P1: Technical documentation; unstructured documentation; screen-snapshots; Prototype	P1: Prototype	P1: Technical documentation; Prototype
Boundary Spanners	P1: agents try to mitigate differences and establish shared meanings; to effectively negotiate trade-offs	P1: Paediatric-manager try to negotiate trade-offs with the others	P1: agents try to establish connections across the different clinic user communities and "sell" the system
Individual capital	P2: Agents valued others team members' individual capitals by considering them as important stakeholders <u>Inductive</u>: Paediatric-manager engages in symbolic discourse of "us-versus-them" by emphasizing Paediatric sites' uniqueness	P2: Paediatric-manager as boundary spanner-in-practice claims authoritative knowledge to legitimize system's configuration at the Paediatric clinics	P2: Midtown-manager as boundary spanner-in-practice claim authoritative knowledge to legitimize system's configuration at the Adult clinics
IS design functionality	P3: Initial configuration proposed by Omega was sketchy and on paper. Link to transformation PMI approach existed but not clearly formulated by management	P3: Evolution - Prototype developed based on Paediatric clinics' needs; Link to transformation PMI approach clearly formulated by management	P3: Final – Reflects idiosyncrasies of Adult clinics, Paediatric clinics and offers inter-site functionality (mix of transformation and preservation approaches)

Table XIII Case 1 Evidence (Proposition 1)

Concepts	Evidence
Fields of practice	**3 Fields of practice: Midtown, Downtown and Paediatric**
	Phase I and II: "There were a lot of procedural differences in terms of how the clerical tasks were done. It was a significant amount of difference between the sites" (Midtown-manager); "There are different sites involved and people who do business differently" (Downtown-manager); "Well you know, Paediatrics [hospital] are a little different… it's a different setting… we are small and we're different, but not like a small adult [site]" (Paediatric-manager); *Phase III*: "It was a culture thing… I can't put my finger exactly on the difference. But there was very distinct culture difference between the Downtown and the Midtown […] They don't really seem to consider themselves a part of the THC umbrella" (IS-Specialist1)
Level of knowledge complexity - High	**Difference is high**
	Phase I: "That was one of our early challenges because what we discovered was the way that the clinics work at one hospital versus another was very, very different" (Midtown-manager); "In fact a lot of the differences between procedures… came along many times as a result of discussions around the user group table during the development" (Midtown-manager)
	Dependence is high
	Phase I & II: "In terms of the dynamic between the players I guess it took us a little while to come to some sort of way of working together where we would listen to our colleagues and you know hear what they were trying to say about how they do this and then try to integrate that into our own experience and say, okay maybe we can do it this way and that will meet both needs […] So, it was close to two years that we were working on this project, we acquired a lot of knowledge about not just how things work in our own [Adult sites] as well and how things work in Paediatric's" (Midtown-manager)
	Novelty is high
	Phase I: "Actually we didn't know each other. We had never met" (Paediatric-manager) "It took us a little while to come to some sort of way of working together" (Midtown-manager)
Type of Knowledge Boundary	**Pragmatic Boundary**: High level of knowledge complexity and the emergence of different interests between the agents
	Phase I: "At the outset actually it was trying to come up with an agreement on all of our parts as to what we wanted this thing to do, coming to that shared vision of okay these are the functionalities that we want. That was one of our early challenges […] By the time we really started hitting that stage of development we all knew each other very well and we had kind of worked out the chinks. The process never got bogged down because of irreconcilable conflicts between members but we certainly did have a lot of strenuous discussions." (Midtown-manager); *Phase III*: "There was huge dissention among myself and other team member […] There's certain tables, references that are sort of critical ones that you should or you should not make modifications too. I didn't want to do it. Someone else did. It really had gigantic implications for all the statistics that were being gathered for AAIS. It became a huge issue between the team member and I. Well, it got resolved to my satisfaction eventually because it had to be in order for the statistics not to be implicated. To me it was a business solution that became personalized and political among the team members themselves." (IS-Specialist1)
Knowledge sharing processes	**Translation**
	Phase I: "At the outset actually it was trying to come up with an agreement on all of our parts as to what we wanted this thing to do, coming to that shared vision of okay these are the functionalities that we want." (Midtown-manager); "We did meetings with the staff we organized, we looked at the weaknesses of the current system, the things we would like to have, but we didn't have; what existed in other systems. And how could we put all of that together and this is what we would like to have – we could have in a system (Paediatric-manager) *Phase III*: "Oh no [common knowledge], no, no, no. I mean obviously the team members knew more until I joined, so I learnt from them. […] it's very much a sharing of information." (IS-Specialist2); "I never saw any documentation on the analysis, the work flow or anything like that. And my personal feeling is that it was left up to the implementation team to go in and do that sort of analysis. I never saw anything concrete, and there were so many

Concepts	Evidence
	deficiencies within the system when we first started using it" (IS-Specialist1)
	Transformation
	Phase I, II and III: "It was a negotiation that I thought went surprisingly smoothly. We took a lot of very different points of view and managed to satisfy the vast majority… there was some enthusiastic discussion bordering on our argument, but we always managed to come to some kind of consensus that if we did this it would be satisfactory to all parties and we did that, so it wasn't always a smooth friendly process necessarily, but it ended up working pretty well" (Midtown-manager); "But we had to compromise on a lot of things… Well there has to be negotiation in the sense that you know, there comes to a point where you, you have ideas obviously about, and convictions about the way certain things should function or not. For example, confidentiality of information is a big topic… We had long discussions about how far we could go in the system. For example, I'm calling, I'm in the middle of a divorce, I don't want my husband to know my phone number. So the big question is how do you block that information, are you able to flag it? Should you put it confidential? So obviously for us in Paediatrics it's a huge issue because we deal a lot with patients, we deal more and more with that kind of situation. On the adult side, not so much." (Paediatric-manager);
	Phase III: "One example would be that there was debate around when you built a template for a clinic. So quota of patients. So this clinic involved 20 patients. And there was another philosophy it should be based more on time. So a 15 minute appointment from 1PM to 4PM. In the end it comes up to numbers too, but it's based on time. So in the end, we decided we would have two modes and you'd choose which mode you would like." (Downtown-manager); "You're trying to sell a system at the same time you need to make it the most appealing for someone to use that. So it's always a negotiation." (IS-Specialist2); "What we did was we started finding ways of tweaking the system to do things that it had not originally been intended to do […]So you know that was an interesting, very non-standard use of AAIS to provide a service that we needed at the clinic." (Midtown-manager);
Boundary objects	**Unstructured Documentation -** *Phase I and II*: "We spent a good two months putting together on paper a framework of what we felt this software should be able to do and these were, you know when I say meetings they were all day affairs. We would sit down, we would break for lunch, we'd come back, and we'd work again so it was pretty intense." (Midtown-Manager); "In that we would see things and draw things on the board, drill it down. We had more of a visual of what things would look like" (Downtown-manager)
	E-mail– *Phase I & II*: "The email and the weekly meetings, those were the two biggies. We did a lot of emailing back and forth in between meetings and then when we got to the meetings we would hash out anything we needed to hash out."(Midtown-Manager); *Phase III:* "anything that we need to make sure had to be documented we would always email to each other" (IS-Specialist1)
	Standardized forms (technical doc) - *Phase I:* "They [developers] initially were working basically off of screen shots. They would show us screen shots and as we were going along so we didn't really get to see a prototype that we could actually play with until fairly late in the process, but at the earlier stages they would show us the screen and they would say you know as a user interface do you think, you know if you click on this it will do that… it's basically like giving you pictures of the prototype and you're saying you know when you click on this button it will bring you to this screen and then they will give us another sheet of paper"(Midtown-manager)
	Phase III: "We had the user manual. Basically we prepared all the documentation for the users themselves. But the only documentation I ever really received was the user manual that Omega prepared which was inadequate" (IS-Specialist1); "formal meetings, set up meetings, discussing clinic workflow, discussing booking practices. Presenting what Omega had to offer, presenting suggestions […]That's where we would pick up a lot of feedback that we would then compile into these wish lists which we then presented to Omega" (IS-Specialist1)
	Models (prototype) - *Phase I, II & III*: "We started actually getting some alpha versions to look at, you know different modules of the software we were able to actually see on a screen. Okay how does this work and actually having somebody using the keyboard to let us go through it… Development continued and then we started getting closer to like real data versions where all the functionality was there, it was just tweaking it to make sure that it worked properly. " (Midtown-manager); "We worked by prototype, which is good, because that was very crucial to make sure that that was okay" (Paediatric-manager); "We had the test environment [prototype]. And then, you know, we would present them [future users] with documentation at the training session afterwards if they needed that." (IS-Specialist2)

Concepts	Evidence
Role of Boundary Spanners	**Boundary Spanners-in-Practice - Knowledge Brokers**
	Phase I & II: "We were all doing it from the perspective of our experience and we were all doing it in order to try to ensure that our populations that we were representing were getting the best products possible. There were several occasions where we didn't agree as a group on what we should do and all of us were trying to convince the others that ours was the best way to go" (Midtown-manager); "I provided a good sort of leadership in that sense […] I had fought for getting it for Paediatric, because there's nothing worse than implementing a new system and losing functionality of the things you had before." (Paediatric-manager)
	Nominated and Boundary Spanners-in-Practice - Knowledge Brokers
	Phase III: "The major concept of AAIS that we really couldn't seem to sell, was the cross-site functionality. We kept saying, "maybe this is the tool that you need". And people still were very leery of using any cross-site" (IS-Specialist1); "I was definitively a salesman […]. We chose departments [clinics] where we would end up with more champions and power users who then would able to network with their people and talk up the system" (Midtown-manager)

Common interests were developed and appropriate boundary objects (structured and unstructured documentation, email and prototypes) were used by the agents to assess and share knowledge at the boundary during all three phases of the project. Boundary spanners adopted the role of knowledge brokers. This involved facilitating translations and the flow of knowledge among the members of the project team (Phase I and II) and trying to make connections across different user communities and enable coordination (Phase III).

Fields of Practice

Phase I and II: These phases involved three main *fields of practice*: the Downtown site, the Midtown site, and the Paediatric site (Table XIII). While there were significant practice differences between the clinics at the two adult sites, the clinics at the Paediatric site had completely different patient scheduling practices (Paediatric-manager).

Phase III: At the outset of this phase there were two fields of practice: the two Adult sites (Midtown and Downtown). As IS-Specialist1 observed (Table XIII), the two Adult site-based ambulatory services were distinct and the two user communities didn't seem to be part of the same organizational entity. However, as the project approached its completion, the two Adult site-based fields found common ground and shared their practices. Therefore, at the end of the ISD process there were present two fields of practice: Adult sites and Paediatric site.

Knowledge Complexity Level – High
Novelty:

Phase I: According to the evidence presented in Table XIII, the level of novelty was high at the beginning of Phase I of the project due mainly to the fact that the agents never met before and now they were supposed to find common ways to work together.

Phase III: As illustrated by the case narrative, the high level of novelty was caused at the beginning of this phase by the level of newness of the technical requirements for the new configuration of the system (cross-site functionality). While the differences between the two sets of practices (Midtown and Downtown) were clarified by now,

identifying common practices that would be reflected by the system's functionality was something novel for the two Adult sites.

Differences:

<u>Phase I</u>: A high level of novelty implies that the existing common language between the agents will not have the "capacity to represent the differences and dependencies now of consequence" (Carlile 2004: p.557). The three representatives of the three fields of practice struggled at the outset to understand the depth of the differences between their practices. For the Midtown-manager the Paediatric site was "a black box". All they knew was that they were using different terminologies and tools in their daily practices for essentially doing the same type of activity: managing ambulatory services. Thus, differences in knowledge of each agent were important and the agents had a hard time to correctly evaluate these differences.

Dependences:

<u>Phase I& II</u>: As previously mentioned, the effect of differences in knowledge is contingent on the degree of dependence each agent had on the others so as to meet project's goal. The complexity of sharing knowledge increases as the management of the dependencies between different agents becomes challenging (Carlile 2004). According to the case narrative and the evidence presented in Table XIII, the agents realized that they will need to rely on the others to be able to carry on the configuration of the new system. The more the agents realized that their knowledge is different than the others, the more the amount of dependencies increased between the agents during the first few months of the project. Hence, the more the amount of effort required to share knowledge of their practices at the boundary increased.

<u>Phase III</u>: As documented in the case narrative, new circumstances emerged at the beginning of Phase III. The upper management was expecting now a system that would reflect new common practices across the Adult clinics. While during Phase I and II Midtown-manager and Downtown-manager depended on each other to acquire knowledge about their site-based practices, at the outset of Phase III the level of dependency between them was significant. This was due to the fact that they were facing now the task of establishing common practices and how to translate them in system functionality.

Type of Knowledge Boundary – Pragmatic

Phase I: From the evidence presented in Table XIII, it can be argued that due to the existing high level of knowledge complexity and the emergence of different interests between the agents at the outset of the ISD process, the team members were facing a pragmatic knowledge boundary. Each of the three site managers was there to represent his/her own field of practice and make sure that the needs of their respective user community will be translated into the new system functionality.

Phase III: During the first two phases the three agents were able to identify common interests and find ways to share knowledge. However, the structure of the team changed at the outset of the last phase of the project. This modification not only created new dependencies among the team members but also brought up differences between the new agents' interests. While the agents' interests in Phase I and II were related to the interests of the user communities they were representing, in Phase III the interests were more of a personal nature. The conflict between the two new team members was sparked by the differences in personal opinion on what is right and wrong with regard to specific functionality of the new system.

Knowledge Sharing Processes– Translation and Transformation

Phase I and II: Facing a high level of knowledge complexity and different interests of the different actors, team members realized that they will not be able to engage in a transformation knowledge sharing process from the outset. They followed an iterative approach where the agents first identified shared meanings (*translation*) and only after they developed the ability to learn about the differences and dependencies between them, they were able to start negotiating trade-offs and transforming their knowledge about practices (*transformation*).

The outcome of the translation knowledge process was the proposal of the first draft of the new IS configuration. Once they reached common grounds, the agents realized that they will have to find ways to mitigate the different interests and viewpoints that each of them had with regards to the future system functionality. The agents assessed the existing site-based booking systems in order to understand what the needs of their respective user communities are and what are the strengths and weaknesses of those systems. These interests were reflecting everyone's user

community needs and obvious consensus had to be reached. Negotiation of trade-offs and comprises of all sorts ensued to alter the system configuration to accommodate the various clinics' workflows. The central stage was taken by the Paediatric-manager that started the negotiation on how to adjust/modify the system's functionality to accommodate the demands of the site-based clinics due to specific procedures needed by the Paediatric site. The two Adult site managers were willing to transform their domain-specific knowledge by trying on alternative system configurations that would satisfy the idiosyncratic needs of the Paediatric site user community. By using site-specific common knowledge (path dependent) Paediatric-manager constrained "the capacity and ability" of the other agents to represent the novelty they were facing (Carlile 2004: p.557). This situation at the boundary helped Paediatric-manager to better position herself to represent her site-specific knowledge.

Phase III: The iterative approach to deal with the pragmatic boundary was extended into Phase III. The transformation process was preceded by a process of identifying shared meanings (translation) between the project newcomers (the two IS specialists and the IS-manager) and the clinic managers from the Adult sites (Table XIII). The new IS professionals were familiar with the technical part of the AAIS but they were lacking the understanding of the different site-based clinic practices and their differences. As illustrated by the case narrative, the ensuing transformation process involved this time on one hand, trade-offs that were negotiated between the team members and the clinics' representatives, and on the other hand an executive decision to solve the conflicting interests between two of the team members that threatened to create barriers to share knowledge. Once the internal conflict solved, the team members realized that in order to advance the project they needed to engage in a process in which they would negotiate system configuration issues with the clinics representatives. Hence, they found alternative and innovative ways to configure the new system in order to satisfy some idiosyncratic needs of the clinics (ex. Infection control clinic at the Midtown site).

Boundary Objects

Phase I: The case narrative and the evidence in Table XIII shows that during the first part of Phase I, the agents started by organizing regular meetings to create an

environment conducive to efficient knowledge sharing towards learning about the differences and dependencies between them. In this vein, the agents used boundary objects such as *unstructured documentation* (ad-hoc drawings on whiteboards and hand-written documents) to assess the knowledge at the boundary and create the foundation of the first system prototype. Then, they used *standardized forms and methods,* such as technical documentation and screen snapshots to identify the differences between the practices of various clinics and the standard functional specifications proposed by the programmers from Omega, and how much they depend on the clinics' users to understand and make representations of the practices in clinics. In the second part of Phase I, the agents used *prototyping* methods because they themselves were in a situation where requirements to develop the IS couldn't be determined "correctly and completely" (Davis 1982: p.19), therefore they needed to permanently relate to concrete versions of the system on which they could make adjustments. The prototype was the appropriate boundary object to be used during the trial-and-error problem solving approach typical for a transformation process.

Phase II: During the Beta testing at the Paediatric site, the team members used the prototype that Omega decided to implement at the end of Phase I. The prototype was used by the agents during this phase as a concrete means to continue the negotiation of trade-offs between the Adult sites managers and the Paediatric-manager.

Phase III: As documented in the case narrative and in Table XIII, during the first part of Phase III, the agents created *structured documentation* (user manuals) as a boundary object that enabled them to identify and learn about their knowledge differences and dependencies (translation process). They also organized formal and ad hoc meeting with representatives from the clinics to identify user needs and better understand the clinics' workflows. In the second part of Phases III, the agents relied on a *prototype* to create versions of the system on which they could make adjustments to accommodate special needs of some of the specialized clinics.

Boundary Spanners– Nominated and Boundary Spanners-in-practice

Phase I and II: At the outset of the project the members of the AAIS project team were expected to be able to share knowledge across boundaries and relate practices in one field (site) to practices in the other two fields by creating and negotiating common

understandings and interests. As illustrated by the case narrative and the data presented in Table XIII, Paediatric-manager and Midtown-manager engaged in activities of spanning boundaries and adopted the role of knowledge brokers during Phase I and II without being nominated as boundary spanners. They were, as Levina and Vaast (2005) called them, *boundary spanners-in-practice,* agents who engaged in activities of translation and transformation of the knowledge of practices that they considered to be pertinent to their respective fields of practice among the other members of the project team.

Phase III: During this phase, the dynamics of the group changed as the upper management hired three IS professionals (two IS specialists and one IS project manager) and *nominated* them as boundary spanners to help the two clinic managers (Midtown-manager and Downtown-manager) to configure the new AAIS based on common practices. As documented in the case narrative, at the outset of Phase III, the new agents struggled to understand the differences between the practices at the two Adult sites and how the two clinic managers approached the system configuration during Phase I and II. This created unexpected delays in the ISD process. The team members became concerned with this situation especially after the release of the early 2002 progress report that was painting a grim situation of the advancement of the project. Becoming a boundary spanner-in-practice required the new agents to become legitimate participants in the practices of both fields (Midtown and Downtown). In 2002, after more than a year of involvement in Phase III of the project, the two IS specialists reached the proper understanding of each site-based practice and were able, along the Midtown-manager and Downtown-manager, to effectively become boundary spanners-in-practice and make connections across the two Adult user communities to convince the users on both sides of the boundary of the necessity of having a unified system for patient bookings.

From the above argumentation we conclude that Proposition 1 is supported for Case 1. Our data analysis suggests that there was relationship between the planned PMI approach and the nature of the knowledge boundary. The case narrative, the evidence presented in Table XIII and the archival documentation point to an existing high level of knowledge complexity at the boundary and a transformation PMI

approach adopted by THC upper management at the outset of the AAIS project. Due to the novelty of the context (individuals that never met before now they had to share knowledge) and the fact that the new system was supposed to bring important changes to the practices of the three fields of practice, different interests among the agents emerged. The agents found themselves facing a pragmatic boundary and in order to be able to effectively share knowledge that had not only to find common meanings, but also common interests to achieve their goals. As documented in Table XIII, the agents initiated iterative processes of translation (identify shared meanings) and transformation (negotiation of interests and transformation of knowledge) across the boundaries during the three phases of the ISD process. To accomplish this, they used boundary objects appropriate for communicating across pragmatic boundaries and some of them performed the role of knowledge brokers by being nominated as boundary spanners or by engaging in ad-hoc activities of boundary spanning as boundary spanners-in-practice.

Proposition 2: *Agents, as boundary spanners, will try to convert their accumulated individual capital (knowledge-in-practice at the boundary) into symbolic capital to make claims about who holds relevant knowledge and create a new model of practices that, when incorporated in the new IS, reinforces those claims.*

Valuation of the Individual Capital

Phase I: Each of the three agents exhibited differences in intellectual and social capitals. As documented in the case narrative and in Table XIV, each agent's knowledge was valued by the other team members and considered as being important for the successful development of the IS. The Paediatric-manager quickly impressed the other two agents with her leadership skills and gained their appreciation. While Downtown-manager gained respect in the eyes of the others by being a strong advocate for the needs of her site-based user community, Midtown-manager was seen as being an experienced manager that was able to provide pertinent advice with regard to the system configuration.

Table XIV Case 1 Evidence (Proposition 2)

Concepts	Evidence
Valuation of Individual Capital	**Valuation of the individual capital of the three clinic managers**
	Phase I: "[The Paediatric-manager], very quickly took on a leadership role… We all respected the hell out of her. [Downtown-manager] was always in there advocating for her clerks" (Midtown-manager); "[Midtown-manager] was very good at argumenting the pros and cons of certain functionality." (Paediatric-manager)
Claims of authoritative knowledge	**Paediatric-manager and Midtown-manager as Knowledge Spanners-in-practice**
	Phase II: "I'm an IS, that's my field of competence, so I'm an IS person so it's very easy to talk to a programmer because I know what they are looking for, type of thing. And I can turn around and talk to the user because I can adjust the language […] You have convictions about the way certain things should function or not. For example, confidentiality of information is a big topic" (Paediatric-manager) *Phase III*: "I think I also had a bit of a – not a biased, but the fact that I was a clerk and I worked in the clinics, I had a very big understanding of their work life… my role at the hospital has been largely managing budgets related to clinic and clinic operations, supervising clerical staff that work in clinic areas and office areas, hiring, firing, disciplining, supporting, whatever, handling renovation projects as they come along, ensuring that they go smoothly, doing implementations like the computer implementations […] Someone else may have needed to get more information, more knowledge" (Midtown-manager)

Table XV Case 1 Evidence (Proposition 3)

Concepts	Evidence
Planned IS Configuration	**No blueprint at the outset; Paediatric-based Configuration in Phase II; Transformation PMI planning in Phase III**
	Phase I: "We weren't presented with a system and said, "Ok, we need to change this, this, and this. We kind of built it as we went" (Downtown-manager); "We had a bunch of 'rinky dinky' little systems that were often DOS-based and clearly we weren't going to get what we needed out of them. It was clear that this was a requirement that we had to have some kind of a common system" (Midtown-manager)
	End of Phase II: "We probably influenced a lot because the whole project actually came from a needs analysis that we [Paediatric] had submitted […] I had fought for getting it for Children, 'cause this was something also that we had before. 'Cause there's nothing worse than implementing a new system and loosing functionality of the things you had before?"" (Paediatric-manager);
Final Configuration	**Different from the initial configuration, reflecting a mix of Preservation (Paediatric) and Transformation (Adult) PMI approaches**
	Phase III: "I never saw any documentation on the analysis, the work flow or anything like that. And my personal feeling is that it was left up to the implementation team to go in and do that sort of analysis." (IS-Specialist2)
	End of Phase III: "We got a very good basic appointment booking tool" (Midtown-manager); "We have to make everybody understand clearly that we can't build the system that responds to every clinic… there's only so much flexibility you can put in a system" (Downtown-manager); "The AAIS is pretty evolved, and became our enterprise booking system. Now I see changes in practices. I see more and more clinics from both sides looking and reviewing appointments for both Adult sites. It might also happen as a result of a momentum finally coming behind the fact that the THC is one entity." (IS-Specialist2); "[The system] evolved because people wanted so much more than what the system was originally designed for." (IS-Specialist1)

Phase II: During this phase, the Paediatric-manager converted her accumulated individual capital into symbolic capital to legitimize her request to develop the system based on the needs of the Paediatric clinics. Paediatric-manager succeeded to convince the other two agents that she was both a manager and an experienced IS person and was able to "adjust the language" and switch from clinical to technical language with ease. In fact her claim was that she had the advantage over the other agents to have the capacity to assess two different knowledge domains: technical (IS) and clinical. Thus, she had no problem in Phase II to pursue her initiative to first, convince the upper management to allow the Pilot test to be implemented at the Paediatric site and second, to pursue the process of system configuration that was based on Paediatric-oriented functionality.

Phase III: During this phase it was the turn of Midtown-manager to claim possession of pertinent knowledge that would have legitimized the system's configuration and helped to mitigate the eventual misfits between the demands of the Adult clinics users and the proposed system configuration. His claims were based on the intellectual and social capital accumulated over the years while managing various departmental and project-related budgets and "hiring, firing, disciplining, supporting" clerical staff under his supervision.

The case narrative and the evidence documented in Table XIV show that only the *boundary spanners-in-practice*, Paediatric-manager and the Midtown-manager, tried and succeeded at different stages of the AAIS development to use their accumulated individual capital for making claims of "authoritative knowledge" and creating a model of practice that was incorporated in the new IS. In conclusion, Proposition 2 is only partially supported for Case 2.

Proposition 3– *The planned configuration of the IS that reflects practices related to a specific PMI approach may be different from the final configuration at the end of the ISD process.*

Planned IS Configuration

<u>Phases I and III</u>: At the outset of Phase I, while there was not a clear blueprint for the new IS configuration, the knowledge sharing practices initiated by the agents were influenced on one hand by the obvious tendency of the Paediatric-manager to conserve the old site-based organizational patterns and on the other, by the operational necessity to replace the existing obsolete systems at the Adult sites. As illustrated by the case narrative and the evidence in Table XV, at the end of Phase II, the new system configuration evolved from a first blueprint (prototype) conceived during Phase I in collaboration between the members of the project team and the Omega developers that was supposed to reflect common industry practices to a configuration that quasi-replicated the pre-merger practices in the Paediatric clinics.

Final IS Configuration

<u>Phase III</u>: At the end of the development process, while not adopted at full capacity right away, the new system reflected new common standards of a common set of practices at the Adult sites clinics.

Our interpretation of the case narrative, the evidence from the interviews (Table XV) and the archival documentation (management documents) is that, while the initial configuration of the AAIS (first prototype) was supposed to reflect the new clinical standards that would have enabled new practices in the clinics (PMI approach of transformation), the agents at the outset of the ISD process were not aware of the upper management strategic direction. The configuration of the system during the first two phases reflected the agents' understandings of others' practices. The Adult site managers were clearly influenced by the Paediatric-manager to approve the system's configuration that was solely based on the Paediatric site needs. The fact that the Paediatric-manager, as a powerful agent, reused a common knowledge (Paediatric site knowledge base) created a problematic situation at the boundary where the other two agents were not able to correctly asses the novelty they were facing. Thus, at the outset of Phase III, the agents, including the newcomers, had to redo the needs analysis and identify the prerequisites for configuring the system to reflect a

transformation PMI approach at the Adult sites. This caused delays in implementation and system user acceptation issues in the long term.

The resulted AAIS functionality reflected a blend of *preservation* (Paediatric site) and *transformation* (Adult sites) and was different from the planned configuration (*transformation*). While the Paediatric users got what they wished for, at the Adult sites, the final system configuration enabled the implementation of new practices and the inclusion of some idiosyncratic needs of some clinics. Therefore, Proposition 3 is supported for Case 1.

Our deductive analysis provided us with the means for understanding the processual nature of the ISD in Case 1. As synthesized in Table XII, each of the three Propositions presented a temporal evolution throughout the three phases of the AAIS development. Management decision to implement new best practices created a pragmatic knowledge boundary between the project team members at the outset of the project (Proposition 1). The emergence of this specific boundary triggered the agents' necessity to deal with the resulted level of knowledge complexity in an evolving fashion across the three project phases. During Phase I, the agents engaged in knowledge sharing processes of translation followed by transformation by using reliable boundary objects and providing knowledge brokering services as boundary spanners-in-practice. In Phase II the agents continued the transformation process in order to finish the implementation of the system at the Paediatric site. In Phase III, due to the changes in the group structure and project context (only Adult sites), the agents had to restart the knowledge sharing with a translation followed by a transformation process. Concerning Proposition 2, during Phase I, the agents engaged in processes of valuation of other team members' individual capital that resulted in the creation of symbolic capital used by two of the agents to claim relevant knowledge in the subsequent phases (in Phase II – Paediatric-manager; in Phase III – Midtown-manager). The IS configuration followed an evolutionary path as conjectured in Proposition 3. While at the outset it reflected a transformation approach, the IS configuration evolved during Phase II and III by reflecting the agents' understandings of the others' practices as

they were influenced by the level of complexity of the knowledge at the boundary and by the symbolic capitals of Paediatric-manager and Midtown-manager.

5.3.5 Inductive Analysis

Theme 1: "Us-versus-them" – Paediatric-manager was the only agent to engage in discourses that would present her as an authorized voice to represent the Paediatric population and its needs with respect to the ambulatory clinics during Phases II and III. She described the members of the Paediatric field of practice as being completely different than the members of the other sites of the THC. During the process of ISD she tried hard to classify the Paediatric site as being unique among the other sites in front of the other team members and to refute any idea of integration.

> "I have to say, *we* being the Paediatric, probably influenced a lot because the whole project actually came from a needs analysis that we had submitted […]. They moved Orthopaedics from the Downtown and centralized it at the Midtown. I think *they*'ve redone some of their management structure in terms of that. But that didn't affect *us.* So the Paediatric will remain independent" (Paediatric-manager)

The evidence confirms the fact that the practices of symbolic "us-versus-them" were necessary for the Paediatric-manager to represent her community during the struggle over classifying the Paediatric site as being unique and its environment not being ready to be included within the THC. The existence of a relationship between Paediatric-manager's discourses of "us-versus-them" and her use of the accumulated symbolic capital pinpointed to the fact that the Paediatric-manager pursued not only individual, but also collective interests when she used her symbolic capitals. Paediatric-manager's collective representations inculcated the reality of the existing boundaries between the Paediatric site and the Adult sites as something that can't be changed during the process of ISD. In our opinion, Paediatric-manager engaged in this symbolic work to reinforce her "authoritative knowledge" and justify the way the system was configured at the end of Phase II.

Theme 2: Continuity of Pre-merger Organizational Identity. The representatives of the three main fields of practice described the existence of site-specific "know-why", specific understandings of the rationale for the different norms and practices and the meanings that legitimized their application within the respective field of practice. The

unique set of norms and values of each field of practice is illustrated as being different among the THC sites. There is always a rationale for each field's practices. However, this rationale was hard to be understood by someone who was not a member of the specific field, such as the IS specialists during Phase III.

> "Every encounter that I've had when it came to implementation came to everything else, was always, 'you're implementing at the Downtown. You're implementing at the Midtown. Well, we do things differently. […] You can't apply anything that you've applied anywhere else here. We need to be distinct'." (IS-Specialist1)
> I think the Downtown is much more of a top down approach whereas the Midtown, from my perspective, they were much more willing to work with you and work for the better of the hospital. " (IS-Specialist2)
> "It was a culture thing… I can't put my finger exactly on the difference. But there was very distinct culture difference between the Downtown and Midtown" (IS-Specialist1)

However, the two site managers, being accustomed to the set of norms and values of their specific fields of practice, understood why the Adult sites were different than the Paediatric one. For them, the site-specific norms and practices still represented their old organizational identities with their own idiosyncrasies.

> [On the Adult sites] "At the beginning it was very much retained, it was very much sort of they each keep their own practices and it's only over the course of time that the wall has got beaten down a bit… That more and more is becoming a case of blending… As far as I'm aware the Paediatric is standalone… And they continue to be standalone. They do what they do inside their black box and they don't seem to have a huge amount of connection in the areas that I deal with." (Midtown-manager)
> "So if you work in Clinic A on Monday and you're well trained and you know I have stamped this paper, this paper, two labels and a Medicare. Tomorrow they shove me in another clinic, I have no idea because that doctor, he wants three labels, the Medicare instead of putting it like this, it should be like this. Everyone wants their own way and it is physician driven" (Downtown-manager)

In conclusion, the staff from each of the three sites of the THC, as members of the same field of practice, shared an organizational identity which was based on an agreement that referred to the existence of pre-merger shared beliefs in the value of what is at "stake" in each of the three fields of practice. If this agreement ceased to exist, one or all three fields of practice would have stopped functioning. Thus, the evidence suggests that the boundary spanners not only were supposed to share this interest in the stakes in each field, but they also needed to learn to acknowledge the rules of each field in order to successfully entice the agents to share knowledge across the boundaries.

5.4 Within-Case Analysis: CASE 2 – The Laboratory Information System (LIS)

5.4.1 General Context and Main Project Stakeholders

In 2002, in their pursuit to integrate the structures of the sites, THC upper management and the Laboratory departments of the THC started the process of selecting a Laboratory Information System (LIS), which would improve the quality of patient care by providing comprehensive overall functionality, accessibility to data throughout the THC, and the flexibility to adapt to future needs and interfaces.

Five years into the post-merger phase, there were three different site-based Hospital Information Systems (HIS) at the THC and most of the departmental systems were integrated only to their "local" HIS. An HIS is defined as an integrated information system designed to manage the administrative, financial and clinical aspects of a hospital. The three HIS systems were: the Midtown HIS, the Downtown HIS (which was also servicing the two Speciality sites), and the Paediatric HIS. Management was hoping that the THC would take an important step in the right direction, that is, to progressively become one integrated hospital, by implementing a common Laboratory Information System. In general, the role of an LIS in a hospital is to automate laboratory clinical, financial and managerial processes and to enable lab staff to establish and maintain accurate tracking, processing and result recording, while avoiding lost and misplaced specimens.

The existence of three independent HIS indicated the fact that there were three independent patient identifier sequences, i.e. each HIS patient registration system generated its own hospital (site) patient ID. At the time, the THC didn't have a Common Patient Index. In this situation, the LIS would receive transactions from the three HIS with the proper site identifier (Midtown, Downtown, and Paediatric). Therefore, it was important that the new LIS accommodate three different patient identifiers, fact that made more challenging the integration of the Medical Laboratory services.

The Medical Laboratory services at the THC include three different laboratory units differentiated by the type of investigations they carry out: 1. *Central Lab* provides specimen collection, management and storage for Biochemistry, Immunology, Haematology, Endocrinology, Coagulation, Urinalysis, and Phlebotomy; 2. *Microbiology* offers specimen collection and analysis for Bacteriology, Mycobacteriology, Mycology,

Parasitology and Virology; 3. *Anatomic Pathology* is concerned with the diagnosis of disease based on the gross, microscopic, and molecular examination of organs, tissues, and whole bodies. In 2002, the three laboratory units were still providing clinical services in a pre-merger approach (independent): the Midtown site lab services, the Downtown site services that included the two Specialty sites, and the Paediatric site lab services. Therefore, each of the three laboratory units was independently represented at each of the two main adult sites and at the Paediatric site. Lab services were provided by six (6) different LIS, each with site-based patient identifier indexes and a unique patient database. The Central Lab and Microbiology units used the same LIS at the adult sites, but two different ones for each lab unit at the Paediatric site. The Pathology unit used three different site-based LIS and the systems used at the Downtown and Paediatric sites were standalone (not interfaced with the "local" HIS). There was a clear need for a unique LIS in the THC post-merger context.

> "It was the opportune moment I guess, you know, like the merger was happening and we were getting this new lab information system so that we could connect all the dots and everybody... all the physicians and the patients" (Path-Tech1)
> "Yeah, it [the LIS] was a driver, because we were only going to have one LIS, therefore we had to have a common set of codes, we had to have a common set of how we were going to work up the work flows, the practices that had to have common protocols, which we did not before. Like – the Downtown would have their own protocols, the Midtown, the Paediatric; so in fact it sort of – was a forced method in making us have common protocols" (Micro-Doc2)
> The LIS project was the first step in – in merging the different hospitals into one lot. Meaning you can't – if you have three different LIS' there's no way you can start merging." (CLab-Doc2)

Prologue. According to the request for proposal (RFP) documentation, the proposed LIS needed to meet two minimal requirements: 1) to successfully address system-wide issues and information requirements to support the multi-site/multi laboratory department model currently in operation; and 2) to present flexibility and capability to support the migration to a single lab department model on multi-sites within the next years and, eventually, a move to a single lab department on a single site in a new facility (LIS RFP, April 2002). The document identifies two main prerequisites for the successful implementation of a common LIS in the THC post-merger integration context: a) To develop a common test index to standardize statistic collection, reporting and create a unique test index for the future LIS; b) To develop common test protocols for each of the three laboratories.

In June 2003 the contract to acquire a new LIS was signed with a global leader in healthcare information technology, hereafter called Sigma. The initial implementation target date was set for September 2005. After several delays and a new software release, the implementation at the last site was done in February 2006. We have broken down the 3 years of development of the LIS into two bracketed phases: Phase I (June 2003 – December 2004) - Retention: Early development based on existing practices and Phase II (December 2004 – February 2006) - Best Practices: Industry standards-based development. The bracketed project timeline is illustrated in Figure 4.

The LIS development committee was composed of three working groups: 1) The Clinical Advisory Committee that had as a role to make key decisions regarding the project scope and direction. The committee was comprised of representatives from the upper management and lab physicians; 2) The IS Project Team that had three main responsibilities: to document and communicate the project status to the Clinical Advisory Committee; to document and communicate the lab services process design and re-design; and to provide expert team members with specific IS knowledge during the design and building of the LIS. The members of the team were: the chief technologists of the laboratories and several IS specialists with experience in clinical applications. Some of the members of the Project team were also members of the Clinical Advisory committee; 3) The Lab Expert Team had the role of documenting and communicating the project's status to the Project Team and coordinate the day-to-day activities of the team in the design and implementation of the LIS. The team was composed of 3 lab expert sub-teams, one for each of the laboratory units: Central lab, Microbiology, and Pathology.

Fifteen individuals, members of the three groups, who were the major stakeholders in the design and implementation of the new LIS, were interviewed. The list of the interviewees is shown in Table XVI.

Table XVI LIS Project Team Composition

Function at the outset of the project	Group Membership	How they are referred in the text	Site (prior to the ISD project)	Background
Physician Central Lab – Site Director	Clinical Advisory committee	CLab-Doc1	Midtown	Haematologist; Chief of Haematology dept.
Physician Central Lab – Site Director	Clinical Advisory committee	CLab-Doc2	Downtown & the two Specialty sites	Physician; site director Central Lab
Microbiology Manager	Expert Team	Micro-Manager	Paediatric	THC microbiology manager; Masters in Medical Lab Science
Pathology Technologist	Expert Team	Path-Tech1	Midtown	College degree; Lab Technologist
Central lab Technical Coordinator	IS Project team & Expert Team	CLab-Tech1	Downtown & the two Specialty sites	Lab technical coordinator
Physician Microbiology – Site Director	Clinical Advisory committee	Micro-Doc1	Midtown	Physician infectious diseases and microbiology; co-director of microbiology lab, also the director for lab quality
Physician-Director Infection Control	Clinical Advisory committee	Micro-Doc2	Downtown & the two Specialty sites	Physician infectious diseases and microbiology medical director for infection control; chief of the of microbiology for the THC
LIS IS Project Manager	IS Project team & Clinical Advisory committee	IS-Manager	Midtown	Bachelor in management; IT project manager
Physician Pathology Lab	Expert Team	Path-Doc1	Paediatric	Paediatric pathologist; Geneticist
Central Lab Manager	IS project & Expert teams	CLab-Manager1	Midtown	Bachelor degree; manager of biochemistry dept.; Manager of the THC Central lab
Central Lab site director	Clinical Advisory committee	CLab-Director	Midtown	PhD biochemistry; Site director of the Central lab
Central lab technical coordinator	Expert Team	CLab-Tech2	Midtown	Technical coordinator Central lab
Lab Medicine Transition Project Manager	Clinical Advisory committee	CLab-Manager2	Downtown & the two Specialty sites	Central Lab manager; Biochemist; LIS project manager (clinical aspect)
Physician – Central Lab Chief of Haematology at Paediatric	Clinical Advisory committee	CLab-Doc3	Paediatric	Haematologist; Chief of Paediatric Haematology dept.
Physician – Pathology	Clinical Advisory committee	Path-Doc2	Midtown	Oral Pathologist; Faculty of Dentistry Associate Professor

Figure 4 Flowchart of the Bracketed Project Timeline

Management Actions

Early attempts to standardize practices in Microbiology labs

Upper management decides to go with Sigma without consulting with Central and Microbiology

The go live is postponed several times

Upper management decides that LIS should reflect a common set of practices

More lab technologists are hired to cover the new HR needs of the labs

1st Proof of Concept

Accumulation of "Show stoppers"

Burnout and turnover of the lab personnel

RFP released

Contract signed

Standardization of ordereables into the SDB; Process of DB built;

Process of standardization continues

New Sigma LIS version released; DB built starts from scratch

Implementation and data conversion @ Downtown

Implementation and data conversion @ Midtown and Paediatric

ISD Process

Spring 2002 — Summer 2003 — End 2003 — September 2004 — Fall 2004 — September 2005 — January 2006

Phase I: Practices Retention – Defence of the Kingdoms

Phase II: Industry-based Best Practices – Pains of the Standardization

5.4.2 Phase I: Practices Retention – The Defence of the Kingdoms (June 2003 - December 2004)

Following the signing of the contract with Sigma, the members of the LIS Clinical Advisory Committee advanced the guidelines for the standardization of the practices of the three laboratory units across the THC sites according to the minutes of the project kick-off meeting in August 2003. Each lab expert team would have to convene and audit the information that was preloaded into the Start database (SDB) and the Order Catalogue. The SDB contains a certain percentage of tables that have been pre-built (Sigma documentation specifies 80%) using industry recognized and standardized data for each of the Central, Microbiology and Pathology laboratories that will use the new system. Those elements that were not pre-built into the SDB would be added during the building phase only after the lab expert teams had defined their own standards based on the existing practices. The Lab units were supposed to wherever possible, to standardize the definition of the "orderables" in the Order Catalogue so that the ordering of a specific type of test was the same across the THC.

> "So the reason that we worked together was not only because we will implement Sigma, it was also because we're meeting to have common protocol. So the LIS helped us to standardize the work, also force us to meet the three labs on a regular basis" (Micro-Doc1)

The lab Expert teams had to analyze their specimen management processes in terms of how the specimens are collected, by whom they are collected, how they are labeled, how they reach the lab, where there are sent (within the lab or to another lab). The process of auditing the SDB and Order Catalogue and reaching standard practice decisions was expected to result in a single "build" of the LIS database.

Typically, according to Sigma documentation, the workflow in a medical lab can be described as a sequence of several processes: a set of tubes containing blood, or any other substance will arrive at the laboratory along with a requisition. The form and the specimens are given a laboratory number (on a label). This label has a barcode that can be scanned by automated analyzers and the test requests uploaded from the LIS. Entry of requests onto an LIS involves typing, or scanning (where barcodes are used) of the laboratory number, and entering the patient identification which gives a destination (hospital department, physician or other healthcare institution) for results to go. Even though this description of a typical medical lab workflow seems to be quite

straightforward, the lab services at the THC were presenting a different reality. The three site-based lab services were using three different workflows, each with a different set of General lab, Microbiology, and Pathology practices:

> "We had Downtown working one way, Midtown working another way, Paediatric working a different way. Microbiology, at the Downtown they were paperless methodology, Midtown they weren't paperless. Working different methods. And at the Paediatric's total manual. Each site had its own history at that point. Each site had its own way of working, each site had their own mission, so trying to incorporate all of these differences into the new LIS was very difficult." (CLab-Tech1)
> "There were three different databases for pathology, each site, Paediatric, Midtown and Downtown, three separate. There were just so totally different, you know, order entry, the way they process, even in the way that they did the basic workflow… everybody had their own little way of doing things." (Path-Tech1)

During the early meetings in Fall/Winter 2003, the mindset of the members of the three LIS working groups reflected site-related norms and values as a result of the existence of the three sets of practices for each laboratory unit. An interviewee describes this situation:

> "There was [this] 'keeper' of the knowledge mentality and tried to gather this information was difficult […]. There was very little cooperation from the physicians that were on that committee and my team. The only time that there was any cooperation was at that meeting...and it's because of this retain [of the practices]. So you would have physicians from the Midtown coming to visit us some days, you would have physicians from the Downtown coming to visit us other days try to get their feet in the system and put their mark." (CLab-Tech1)
> "Mostly concerned about of trying to keep things the status that they were. But they were quite open to changes; they were very excited about the idea that there would be one system that they could access, because [at the time] they needed three separate logins. But at the same time, they wanted to make sure that they could maintain their own little *kingdoms*" (Path-Tech1)

In this context, the project members tried to defend their own site's values and norms by describing professional boundaries between the former independent hospitals.

> "Well, we heard, 'Well, we are doing this' and 'No, we are doing that and we would like this and we would like that and this doesn't make sense' and you know… Why should we still offer certain tests, you see, because some people can say, 'Oh, yes, this test is very useful'. But others don't share the same opinion and they think it's an obsolete test that is now being replaced with another one." (CLab-Tech2)

At the outset of the project the members of the working groups were facing two important challenges: Sigma's technology that was completely new to everybody and the individuals' membership to three different sites that had their own practices, structures, values and norms.

> "When it came to building the system, this was something new for everyone. This was going from three different databases to one database. This was having three feeder

> systems into one feeder system. This was the first time...this was the biggest project that hit THC at that time." (CLab-Tech1)
>
> "The biggest part of my problem was I had not only different areas; we had different directors for each site. So there was the Downtown microbiology director, the Midtown microbiology director and the Paediatric. So I had three bosses to work with." (Micro-Manager)

The members of the various LIS working project teams would sit in weekly meetings. The design stage, prior to the actually "built" phase of the system, would involve reaching compromises with information collected by the Expert team (what they would like the new system to be able to do) about how things were working at that time and how the agents would want them to work. At the outset of the project it was anticipated that approximately 10% of the DB would be built by December 2003 so that it could be tested for a proof of concept. The proof of concept was presented to the Clinical advisory committee in February 2004 and its testing was performed to see if the design met the three lab units' needs. Once the proof of concept was tested, the design process continued in iterations before committing to a final build.

To advance the project, team members tried to understand the three different set of practices to build a first proof of concept.

> "It basically was seeing how the other person thinks. You know if you come into it with an understanding of how institutions work and not all institutions work the same and ours is different for a lot of reasons, the way we've evolved. Just as blood taking has evolved totally different at the Downtown." (CLab-Doc1)
>
> "They got together and review all their procedures, reviewed all their lab tests, reviewed all their descriptions of lab tests; a good example is at the Midtown a CBC, 'complete blood count', and at the Downtown was called a 'haemoglobin one'. Okay, so even the descriptions of the tests were different. At the Paediatric it could have been called something else... It's a labeling; they had to sit down and say okay, this how you call it at this site and this how you call it at the other site ... you have three sites. How are we going to call it now, because we have to come up with a new description." (IS Manager)
>
> "The first major thing as far as pathology was concerned was, we had to determine what kind of orderables or tests and or reports that they were going to need. And so this was collaboration because there're lots of special things, it's like anything, in Gen lab there's A to Z test and these ones don't do this. So we had to come to an understanding of, you know, what we were going to call these things." (Path-Tech1)

During the ISD process the main technical document used by the agents was the Solution Design Assessment (SDA), which had a two-folded goal: 1. To constitute the foundation for the process of standardizing the disparate processes of each of the laboratory departments into a common "best practices" approach; 2. To lay the foundation of the blueprint for the design and develop ("build") of the new LIS (Sigma

documentation). Most of the content would be represented by standard operating procedures (SOP) that included screen shots and lab protocols.

> "At the adult sites we standardized our requisition to a standard downtime requisition which both adult sites would use when the system is down and they have to send a sample. We set up all kinds of protocols with nursing for what do you do when the HIS [Hospital IS] is down. If the HIS is down you're not going to get a label either so it's different you know when the HIS is down you're going to be able to post the order but you won't get a label either if the HIS add on a test, how are you going to do it. You're going to get a separate label, another label printed and the like. So for the adult sites within the internal workings at the hospital we had a lot of communication with nursing, we had a lot of protocols written up for different procedures, downtime procedures in particular type of thing to be followed, also, procedures in terms of labeling, SOPs with screen shots." (Micro-Manager)

While the IS project team was forging ahead with the building of the system, the members of the other LIS working groups were not able to make significant progress in the process of standardization of the SOPs and the orderables. According to the minutes of the LIS project team meetings during Winter/Spring 2004, some labs were in a "retain" stage. The clinicians from the different site-based labs were not able to find common grounds for test codes and orderables, so the IS project team members decided to adopt a "retain" approach, that is, to try to accommodate as many old procedures and workflows as the new system would accept. This situation is described in the comments of one of the interviewees, member of one of the Expert teams:

> "My understanding was that because of the time constraints which were absolutely unrealistic at the time, we were told that the system had to go live in September. So that was just like six months, something like that. Who had said the system should be ready by that date was never clear to me. But it obviously was not realistic. So because there was such a short time, we thought we'll just reproduce what we know, what we have or translate it into this new system." (CLab-Tech2)

The advancement of the process of the LIS development depended on the identification and eventual standardization of the SOPs. Therefore, each of the three lab units had a designated team member that would act as a knowledge sharing enabler and try to identify the appropriate knowledgeable individuals at each site-based lab and ensure that these individuals were enticed to share their knowledge of their own practices. In the Central lab IS and Expert teams CLab-Tech1's task seemed to be achievable:

> "It's probably because I could push it. I'd been in the business levels for a long time. I know the players. I know what they want. So to me it wasn't as challenging as it was for other people. If someone wanted to push something through, if they didn't get my blessing it wasn't going to happen." (CLab-Tech1)

However, the situation was different in the other two units. The two designated team members, Micro-manager and Path-Tech1 found this activity challenging:

> "I did a lot of the rounding telling people do you know at the Midtown they do it this way, the Downtown, [that way]. So I tried to pass on one test to the Midtown and I got told off by one doc saying I had no business and so 'I said fine, so write your procedures'. What I tried to do most of the time was if they thought they were the best way, write down your procedures and then we'll check against the [industry] standards. So when you did that, there's nothing that you could do or say to say that they're both following the same standards, how can you be better or worse, but they were saying our technicians are better trained, our technicians have better supervised, because they didn't want to lose their power, lose their testing in their site. They had a big problem to trust the technologists from the other site. The worst part was the same doctors that had problems trusting the other site they wanted everybody to send to them. So they were telling everybody 'you trust us, but we can't trust you'." (Micro-Manager)

> "For the adult site, it was a little bit more difficult because sometimes when you asked the department heads, who should I be talking to about this issue? And it was like it wasn't always the same person that they would make available to you so it was very strange. They would have sometimes you go to the site Director at this site, next time he was too busy to see you and send you to another person. It was kind of like 'Okay, what do you want? What do you need?'" (Path-Tech1)

According to the minutes of the LIS Project team meetings towards the end of spring 2004, the project hit several hurdles. First, the nurses were feeling overwhelmed by the number of changes that the new LIS would affect in their workflows and that would also require that their resources be available for training. The nurses' representatives were concerned about the length of time that would be required to build common ordering screens for the adult sites in HIS. These screens would be necessary and did not currently exist. Second, the IS project team identified a list of 38 items that were considered as being "show stoppers" and that needed to be addressed by Sigma in order for the IS project team to move ahead with effective testing of the new system. In August, a significant number outstanding issues that were still unresolved by Sigma were preventing the completion of the IS project team's work. One of the critical issues was related to Clinical Validation in Microbiology, which prevented users from being able to enter results when Clinical Validation was "ON". As a result, it was necessary to keep Clinical Validation in Microbiology "OFF" in order to be able to enter results. At that time the new THC Microbiology director considered this issue as being unacceptable.

In this situation the initial date for the LIS implementation and data conversion from the old systems that was supposed to be September 2004 was tentatively moved to November and then December 2004. In December 2004 upper management

stopped announcing a new date until the critical issues were properly dealt with "because it was becoming an embarrassment type thing because we weren't resolving these show stoppers" (CLab-Tech1).

5.4.3 Phase II: Industry-based Best Practices – Pains of the Standardization (December 2004 – February 2006)

At the end of December 2004, the Chair of the LIS Clinical Advisory Committee informed the other committee members that a new date for the new system implementation would only be recommended to the committee after a review of the outstanding activities and issues, and in consultation with the CEO of Sigma. Several meetings between Sigma and the THC were held to review the list of issues and outstanding activities to ensure that all the steps were being taken in order to propose an achievable conversion date to this Committee. The outcome of the discussions resulted in Sigma advising the THC that the Microbiology Clinical Validation functionality would be available in the latest LIS software release, which was the 2004 version. At that time, the working group members were developing the new LIS on the 2003 version platform. In addition, Sigma claimed that the upgrade would provide fixes to some of the reported problems found in the 2003 version.

Due to the new developments, the Expert and IS project teams had to start from scratch the process of building the database of the system. A significant part of the effort put into developing the system based on the previous version was basically in vain. Thus, during this period the level of frustration of the members of these two teams was very high. This situation is described by CLab-Tech1:

> "We went to a different version… completely different. And then when the new version was available we had to scrap and start fresh. When it came to something as simple as placing orders on the system, we had to satisfy systems that were already in place, such as the HIS [legacy system]. And we had to take care of the old systems at the same time. Hectic times! Making sure that nursing was aware that we were moving tests, reference ranges were changing. Physicians had to know all of this. It was bad times." (CLab-Tech1)

During Phase I, while defending their "kingdoms", the project team members still tried to identify and agree upon some clinical common grounds to be able to advance the development of the LIS. Now, during Phase II of the development, the nature of the group dynamics changed from what it was in Phase I. Not only was a constant

pressure from upper management that the development process needed to speed up, but also the members of the Clinical Advisory committee and the Expert teams realized that they must agree on common standard procedures that would reflect industry best practices. Therefore, a mix of compromises and executive decisions resulted from the weekly meetings of the IS and Expert teams.

> "Yeah, a lot of discussion... It became a moot point for us and we had decided that we would make sure everybody would be able to do the same quality work and it was like a promise saying, and that's basically what we had to do… So we made sure we'd call the meeting, give them two week notice and we said okay if you can't come, send in your comments. If you don't send in any comments within the two weeks it's point finale" (Micro-Manager)
> "They don't know what's really important for [adult sites], that's why we had to meet almost every Thursday and we had to hammer it out sometimes. There would be some shouting matches… more like, 'I don't agree with this, I don't agree with this', and sometimes we would have to say let's try it for six months and then see what happens…. So there's been times when you're trying to get someone to – get a site to change and sometimes there were heated discussions you know, and sometimes we decided to leave it alone, depending on how important it was to change…" (Micro-Doc2)
> "Okay you have Microbiology at the Paediatric, Microbiology at the Midtown, Microbiology at the Downtown, we have to get representations from each site with a chief, a head of – and they have to talk, they have to come up with a standardization or common practice, they have to change it to be the same. And we had one leader of this expert team coming to the steering committee… So 'Where are you, are you done? Is your piece done, do you have your list ready?' They had a list of things that they had to review and standardize and come up with the same way of doing things. Common, it had to be common. No matter what you pick you have to pick one." (IS Manager)

Sigma provided the members of the IS and Expert teams with a remote access to a mock-up LIS database at the company's headquarters. The database was populated with fictive organizations and patients. The team members were able to learn or to verify their knowledge about how to build and configure the new system by using this tool. On a regular basis the IS team members were testing LIS prototypes and the interfaces to the HIS and organizing simulation sessions with the lab technologists. Not only did the IS team members have to learn the programming language of the Sigma-based platform, but they also had to understand the labs' workflow and procedures. The importance of the latter aspect is emphasized by one of the interviewees:

> "LIS is supposed to help lab people to do their work so they [IS team members] need to understand that everything starts on the bench. It's what you do in the lab that you should be able to do a good programming to get, it's not supposed to be Sigma that will tell you what to do." (Micro-Doc1)

The members of the Clinical Advisory Committee, managers and physicians, decided to mediate the process of standardization of the practices that was slowing down the work of the IS team members. These individuals had on one hand to mitigate the "us-

versus-them" attitude of most of the site-based Expert team members and on the other hand to adopt a firmer attitude and take unilateral decisions when needed:

> "Most of the time we were able to influence each other, arrive at a common, you know understanding. And based on their experience and based on some of the results that they've – we're able to show that it really worked, and if we weren't able to convince one site, let's say the Midtown; we'd say for example we were using a special technique to look for [test β] at the Downtown and it was working beautifully for at least a year; they'd never did it at the Midtown and they were a little bit reluctant and we said, we'll try it for three months. And so that would be the strategy that was used – you know, try it and see if it works for you or not. And then adopt it if it does. [Sometimes] we'd go round and round and finally I had enough and – that didn't happen too often – when they didn't agree with the change, we had to make the change." (Micro-Doc2)

> "Frequently I would be the mediator […], the person to try to calm it down, but again, you have to pick your battles. So if it doesn't have too many consequences, we have had to accept that the Paediatric will do something and the adult sites will do something different, just to keep it quiet. So it was not easy […] Incidentally, I was nominated to help for the LIS and I convinced my colleagues that there was only two ways. We can be against Sigma, but we get it anyway, or we can collaborate." (Micro-Doc1)

> "My main role was that in fact, we have them in the same room and discuss and try to facilitate and the discussion between the groups and try to find a common solution that would agree, that would be agreed by most of them if not all." (CLab-Manager2)

> "I was one of the people who said we need these meetings, we need to try to get people involved. I was helping [Path-Tech1] to push to do that." (Path-Doc1)

LIS testing in the production environment started at the beginning of April 2005 after completion of all the build. This activity was completed by mid-May. During this period the IS team identified and solved a significant number of issues. However, at the end of the testing period, there were still a few important issues and more analysis and testing were needed. The labs also ran into another problem during the development of the new system. While at the beginning of the project, Sigma claimed that the functionality of the new LIS would supposedly enable THC management to cut a few lab technician positions, at the end the reality was that this did not happen. In fact, it took more people to implement the system then was supposed to and, as a shock to the lab staff the LIS would increase the lab technicians' workload. As a result, negative consequences ensued, such as burnout and employee turnover. One interviewee described the situation:

> "They [upper management] have decided to start at the Downtown and it was supposed to be a few months later at the Midtown, but you know what happened, it was going so bad at the Downtown that this has been delayed and a lot of the promises that Sigma, on the request for proposal they said yes we admit in fact this was not true. People were working that; we had a lot of burnout. People were working 12 hours a day, seven days a week to do the programming okay. It was a lot of stress and some people just said they don't want to work with that so they just go out." (Micro-Doc1)

In September 2005 after a year delay caused by issues unforeseen by Sigma and the IS and Expert teams, the new LIS was put into production at the Downtown site. The other two sites, Midtown and Paediatric followed in February 2006. At the signing of the contract, based on the upper management requirements for Lab best practices, Sigma was claiming that the new system was 80% configured and the THC would have to develop the rest of it to accommodate inherent local contingencies. However, two and a half years and two major revisions later, the LIS at the THC had a significantly different configuration than the one that was proposed at the outset of the project.

> "At the beginning when I first got involved they [upper management and Sigma] said it was going to be 80% built by the vendor, like 80% ready and then we would only have to put in the 20%. Not the reality. (Path-Tech1)

> "They [upper management and Sigma] told us it was 80 percent built. I don't know what they meant by that. Yeah, because there was nothing to, okay it was like a skeleton, like with that you can't do much with what they give you. You have to input all your orderables; you have to input all of your text (Micro-Manager)

The new LIS changed practices in two ways: first it unified all protocols (ex. orderables) across the sites and linked the labs in one common system. So this meant that, for example, if a lab technician worked at the Midtown site and performed a certain test that was not done at the Paediatric or at the Downtown sites, physicians from the other sites could instantly access the written result. The system also allowed tracking the flow of samples between sites more easily.

> "Everybody is doing the same. Across the board. Even the Paediatric. They don't have the same prefixes but it's the same thing." (Path-Tech1)

> "I think the practices were reasonably uniform after the system was implemented. That certainly was achieved." (CLab-Director)

Second, the labs had to change their workflow, how the staff was managing the lab requests because of the LIS that imposed one set of common practices. This was especially evident at the Adult sites labs:

> "Well the system brought up a lot of changes and the procedures in the sense that all their work flows, well… the majority of their [Adult sites] workflows have changed. Where they receive the specimen, how the specimen is handled, how they record the procedure in – when and how they record the procedures in the new system. They had to review and I guess this is something that, going back in time, we had to develop new workflows as we were doing the implementation, which should have been done right then from the beginning I think when you look at reengineering our department they looked at the best way of doing it. And today as a matter of fact we had no choice but to do it that way. We had to standardize it so it would be the same across board." (IS-Manager)

"Because of the way that Sigma is done, we have had also to change the workflow, how we manage things in the lab. This, probably for technologists, has been the biggest difference" (Micro-Doc1)

"Significant, there is a significant amount of time required to do different things that weren't done. One example would be just for ordering special stains on slides, before we used to fill a little piece of paper and drop it off in a box and now we have to key it in, so the keying in takes much longer than writing it out on a paper. Other things, for billing we weren't involved before, now billing, that has been given to us as a responsibility to bill the cases when we sign out a case. That can take quite a bit of time. It can take five, ten minutes per case in some instances where we didn't do that before." (Path-Doc2)

While the workflows changed completely at the Adult sites, the Paediatric site kept its own order entry procedure:

"So it is standardized between both sites, those policies are the same for both adult sites. [Paediatric site] didn't and still don't have order entry on the floors. So that's why they adapted what they're doing in the lab you know because they're getting the samples the same way as they always got them." (CLab-Manager1)

According to Sigma, the new LIS was configurable enough to accommodate some local contingencies. However, one year after the system implementation was completed laboratory technicians were still using some "workarounds" to accommodate a number of local practice idiosyncrasies. Therefore, according to CLab-Manager2 some users were using the LIS in a different manner than others.

"We thought that there was one way of working with the system, common to all the sites. But a year after the implementation [2007], we did a follow up. So Sigma came onsite to discuss with the users, to have their feedback. And at that time we find out that some people were expressing their concerns about the functionality and we found out that they [lab staff] resolved it. But they didn't tell anyone about this. So we found out that there were some different practices … workarounds depending on the problem. So at that time it was decided, to create end user groups that will meet regularly to discuss their concerns or the problems that they have using the system so that we could find common solutions for everyone." (CLab-Manager2)

Epilogue. After more than three years of hard work of developing the new system, the lab community at the THC had great expectations toward the new LIS. In comparison to the former LIS systems that every site-based lab unit had, the lab staff was very disappointed with the performance of the LIS system. In a post-implementation meeting of the Clinical Advisory Committee, at the end of May 2006, Path-Doc2 stressed the fact that every task performed was taking more steps and time to complete than before with the old system. Workload had increased, secretaries and technicians were working a maximum amount of overtime, and doctors were not receiving reports in a timely fashion. Thus, Path-Doc2 expressed the wish to have some

of the redundant and repetitious steps reduced as they were severely affecting the day-to-day function of the lab, or hiring additional staff would be required. Other members of the committee also complained that the LIS system has increased their department's daily tasks, but in general it was felt that this slowdown could be also due to insufficient training and unfamiliarity with the new system.

Even though the members of the lab services community got used to the new common practices, three years after the LIS was put into production (spring 2009 – time of the interviews), they still resented the new system for causing the loss of the their pre-merger organizational identity. This is illustrated in the following comments of two of the interviewees:

> "Well, the overall consequence from the point of view of the integration of LIS per se, was the loss of institutional identity." (CLab-Doc1)
> "The culture within the THC has always been, five hospitals for them, and it's very difficult to be able, even at the level of directors, to make them understand that in fact when we compete against the other health centers in our region, we need to work together. People know it, but people do not want to do it." (Micro-Doc1)

5.4.4 Deductive Analysis

For THC upper management the new LIS would enable unified, best practices for the lab services (as mentioned in the THC archive documentation) and force the lab managers to attempt to standardize their practices across the sites. The new LIS was built and implemented over a period of two and a half years. Upper management pressure, significant amount of system building and configuring, and boundary spanners' actions made the new LIS reflect a mix of transformation and preservation PMI approach.

Our analysis is synthesized in Table XVIII and the evidence is presented in Table XVIII (Proposition 1), Table XIX (Proposition 2) and Table XX (Proposition 3). We used the same approach for data analysis as the one adopted for Case 1. Therefore, the analysis of each of the three propositions was broken down by phases of the project.

Proposition 1: *The planned PMI approach will shape the nature of the knowledge boundary between the fields of practice concerned by an ISD, thus creating demands on the types of knowledge sharing processes and boundary objects that the agents involved in an ISD will require for adequate knowledge sharing, as well as on the role of the boundary spanners.*

As documented in the case narrative and synthesized in Table XVIII at the outset of Phase I there were three site-based fields of practice: the Midtown site, the Downtown site and the Paediatric site. Within each site there were three different laboratory units (Central Lab, Microbiology and Pathology). At the end of the project, the labs at the THC started to use a common main set of practices (lab protocols), but kept differences between the Adult sites and the Paediatric site in how the lab order entries were managed. The evidence shows that at the beginning of Phase I the context of the project had a high level of novelty that influenced the agents to not be able to correctly assess differences in knowledge of the others' practices and the dependencies between the team members. The agents had to find common meanings to understand each other's practices. In the same time different interests emerged among the agents due to the fact they realized that they must transform their knowledge invested in their own site-based practices. Thus, due to a high level of knowledge complexity and the existence of different interests among agents, the nature of the knowledge boundary the agents were facing it can be considered as being pragmatic. Agents identified trade-offs and used appropriate boundary objects (structured documentation, email and prototypes) to assess and share knowledge at the boundary during the two phases of the project. Boundary spanners engaged in the role of knowledge sharing brokers. This involved enabling knowledge sharing practices across the boundary and negotiate trade-offs where interests diverged.

Table XVII Case 2 Analysis
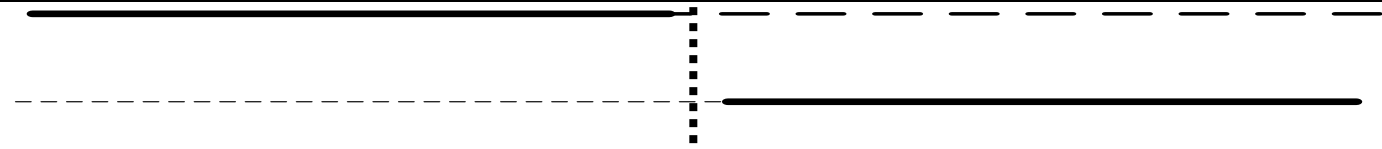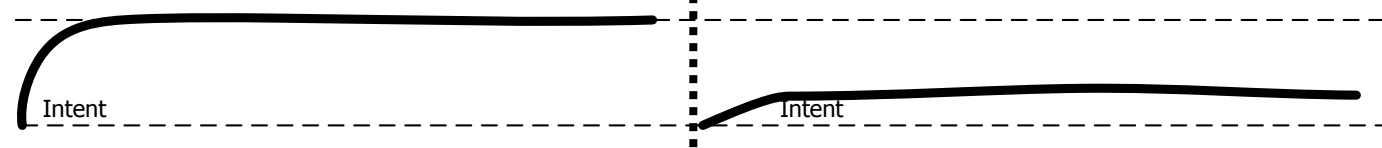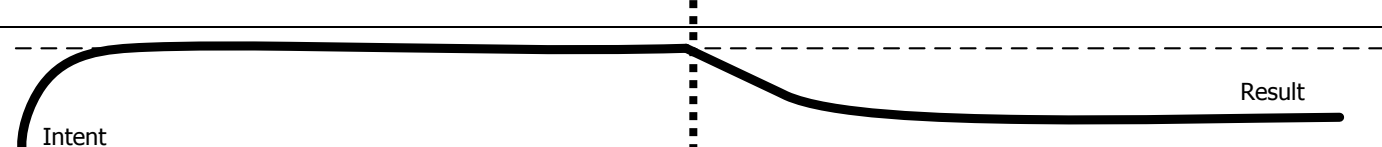
	Phase I	Phase II
Fields of practice	P1: At the outset – Three: Downtown, Midtown and Paediatric Inductive: Field's identity linked to the old organizational identities. Some agents are still in "mourning" after the identity loss.	P1: Outcome – Two: Adult and Paediatric - A common set of main practices (lab protocols) and two different approaches for the test order entries between the Adult sites and the Paediatric site.
Knowledge complexity	P1: *High level of complexity* - At the outset the agents were not able to correctly assess the differences in knowledge; they didn't know how much about dependencies; high level of novelty	
Type of Knowledge Boundary faced by the agents	*Pragmatic boundary*: High level of novelty caused different interests between agents that limited their capacity to correctly assess and share knowledge at the boundary.	
Knowledge Sharing (KS) process	P1: *Translation* (agents needed to establish shared meanings) to establish efficient collaboration and build a first proof of concept	P1: *Transformation* (needed to develop common interests and trade-offs between team members and labs' staff)
Boundary Objects	P1:Structured documentation (SDA - Solution Design Assessment); email	P1:Structured documentation; Prototype (mock-up database)
Boundary Spanners	P1: Nominated boundary spanners try unsuccessfully to mitigate differences and entice agents to share knowledge	P1: Boundary spanners-in-practice negotiate trade-offs
Individual capital	Inductive: Agents representing Adult sites engages in symbolic discourse of "us-versus-them" by emphasizing the differences in practices between the sites and the "betterness" of one lab over another	P2: Boundary spanners-in-practice claim authoritative knowledge to legitimize system's configuration
IS design functionality	P3: Initial – Initial configuration proposed by Sigma was based mostly on industry best practices (80%) without taking into consideration the local idiosyncrasies (*transformation* approach)	P3: Final – mix of industry-based practices and some necessary "workarounds" (modifications in the system) to accommodate some of the labs' idiosyncratic practices (mix of *transformation and preservation* approaches)

Table XVIII Case 2 Evidence (Proposition 1)

Concepts	Evidence
Fields of practice	**3 Fields of practice: Midtown, Downtown and Paediatric**
	Phase I: "Workflow processes were different for the Midtown and Downtown, they were different at both sites. Paediatric is a totally different workflow because there is no order entry on the floor." (CLab-Manager1); "Each site had its own way of working, each site had its own mission." (CLab-Tech1); "The Paediatric is very different" (IS-Manager); "Workflow processes were different, I could speak for the Midtown and the Downtown, they were different at both sites." (CLab-Manager1); "Completely different, because each site, they were doing a different methodology to do a lab test […] we have physicians that work on both sites and sometimes they do not understand why a report at the Midtown would be completely different than the report at the Downtown" (Micro-Doc1); "If you looked at inter site between the Midtown and the Downtown adult sites, they had different chart structures, different admission sheets" (Physician1);
	End of Phase II: I think the practices were reasonably uniform after the system was implemented. That certainly was achieved (CLab-Director); "Yeah, but I have to say like – most of – you take the protocols now the practices it's probably 90 per cent similar" (Micro-Doc2); "So it is standardized between both sites, those policies are the same for both adult sites. [Paediatric site] didn't and still don't have order entry on the floors. They did not standardize the way they work to the way we work in the lab. The Pediatric is different. I would say the Downtown and Midtown are a lot closer in terms of the standards." (CLab-Manager1)
Level of knowledge complexity	**Difference is high**
	Phase I: "At the beginning they [team members] were not listening because each one wanted to have his way being the way that outdid the others. They were mostly discovering what was going on the other sites. They didn't have a clue." (CLab-Manager2); "That was like 'Joe' works at this bench. 'Jim' works on the same bench; he's going to work on what he thinks on that bench. So trying to bring these two people together from the same site to say how do you do those tests, you get different answers because there's nothing on paper. You take those two people that have different visions of doing the same work. You multiply it by three sites." (CLab-Tech1); "At the beginning we did not understand each other at all" (Micro-Doc1); "We had a big problem because nobody knew the names of the clinics […] everybody had a whole different name for their clinic so we had to standardize that and even after standardization we were still confused." (Micro-Manager); "I am sure that was part of why they were so stressed out in that team because no test had the same name. There were three different, three different sets of parameters and somehow they had to mix them together." (CLab-Director)
	Dependence is high
	Phase I: "If I take for example just the network team, I knew I was dependent on them to provide feedback into the project." (IS-Manager); "Well we we're very dependent on the technologists because [of] what they do – so the assistant chief tech even to this day when we have a protocol meeting they're still included because they know exactly at the bench level what's going on" (Micro-Doc2); "They [Team built project] did not have much to work with. I would have sent them elsewhere where the same system was being used. I suggested this in the committee meetings. I told them that I did not understand why they were not being sent elsewhere so that they had something to start with." (CLab-Director)
	Novelty is high
	Phase I: "This was something new for everyone." (CLab-Tech1); "I had not only different areas; we had different directors for each site. So I had three bosses to work with." (Micro-Manager); "I felt sorry for them [IS Project team] because they were thrown in cold. This was very novel for most of them." (CLab-Director); "I looked at it as a complete new challenge" (Path-Tech1); "I was working with people that I didn't know" (CLab-Tech2)
Type of Knowledge Boundary	**Pragmatic Boundary**: High level of knowledge complexity and the emergence of different interests between the agents
	Phase I: "Of course it was new for me, we had to coordinate all the activities from these different groups who had different goals also." (CLab-Manager2); "Physicians from different departments, different labs in the same discipline could not agree on what to do with tests. On what to do

Concepts	Evidence
	with procedures, couldn't standardize." (CLab-Tech1); "There was no choice. The choice was this is the only system we can afford. There was not, okay this is system A, this is system B, this is system C. If we buy B it will be more expensive but it has such and such functionality. Basically it was: 'Sigma is the cheapest and we can't afford the other ones'. So, it was Sigma or nothing." (CLab-Director); "I tried to pass on one test to the Midtown and I got told off by one doc saying I had no business and so 'I said fine, so write your procedures'. What I tried to do most of the time was if they thought they were the best way, write down your procedures and then we'll check against the [industry] standards. So when you did that, there's nothing that you could do or say to say that they're both following the same standards, how can you be better or worse, but they were saying our technicians are better trained, our technicians have better supervised, because they didn't want to lose their power." (Micro-Manager)
Knowledge sharing processes	**Translation**
	Phase I: "It basically was seeing how the other person thinks. You know if you come into it with an understanding of how institutions work and not all institutions work the same and ours is different for a lot of reasons, the way we've evolved. Just as blood taking has evolved totally different at the Downtown. So if you go in with that attitude and listen to their side of the story" (CLab-Doc1); "They got together and review all their procedures [...] so even the descriptions of the tests were different." (IS-Manager); "We had to determine what kind of orderables or tests, or reports that they were going to need. So we had to come to an understanding of what we were going to call these things." (Path-Tech1); "In the beginning it was a facts gathering and trying to come up with commonality." (CLab-Tech1)
	Transformation
	Phase II: "Yeah, a lot of discussion, a lot of deciding best practices and basically in the end it had to go with the best practices... It became a moot point for us and we had decided that we would make sure everybody would be able to do the same quality work" (Micro-Manager); "There would be some shouting matches... more like, 'I don't agree with this, I don't agree with this', and sometimes we would have to say let's try it for six months and then see what happens.... and sometimes we decided to leave it alone, depending on how important it was to change..." (Micro-Doc2); "They have to come up with a standardization or common practice, they have to change it to be the same. Common, it had to be common. No matter what you pick you have to pick one." (IS-Manager); "If there was no consensus on the team that this was the right way to go, if we had an issue where we couldn't resolve, we would always go back to the bench text, to the text that were actually working rather than going to management and getting information, when we received that information we would package it and push it to management and say this is what has to be done." (CLab-Tech1); "And what we did is that if there are some different clinical practices we allowed some exceptions in the protocol that we use. The Paediatric had very different protocols and we've had to make more exceptions, and the culture of the Paediatric is completely different that the adult [sites]. So we've had a lot of fights and finally we accepted some exceptions, but for the adult sites we did a lot of work to try to get to a consensus." (Micro-Doc1)
Boundary objects	**Standardized forms (technical doc, screen-shots, email)**
	Phase I: "We had a lot of protocols written up for different procedures, downtime procedures in particular type of thing to be followed, also, procedures in terms of labeling, SOPs with screen shots." (Micro-Manager); "E-mails, phones, meetings, there were a lot of project status reports, there was Microsoft project management tool. (IS-Manager)
	Models (mock-up database, prototype)
	Phase II: "Basically we had a system set up in Kansas city, it was a mock system with fake organizations and then we looked at the built and the reason for that is we were lucky with that because IS did not set up our hardware on time so we had to work with this in order to learn" (CLab-Tech1); "Yes, to test it to the lab to see if it's working, test the interface and a lot of simulation by technologists" (Micro-Doc1)
Role of Boundary Spanners	**Nominated Boundary Spanners - Knowledge Sharing Enabler**
	Phase I: "It's probably because I could push it. I'd been in the business levels for a long time. I know the players. I know what they want. So to me it wasn't as challenging as it was for other people" (CLab-Tech1); "I did a lot of the rounding telling people do you know at the Midtown they do it this way, the Downtown, [that way]. So I tried to pass on one test to the Midtown and I got told off by one doc saying I had no business and so 'I said fine, so write your procedures'. What I tried to do most of the time was if they thought they were the best way, write down your

Concepts	Evidence
	procedures and then we'll check against the [industry] standards. So when you did that, there's nothing that you could do or say to say that they're both following the same standards, how can you be better or worse, but they were saying our technicians are better trained, our technicians have better supervised, because they didn't want to lose their power, lose their testing in their site. They had a big problem to trust the technologists from the other site. The worst part was the same doctors that had problems trusting the other site they wanted everybody to send to them. So they were telling everybody 'you trust us, but we can't trust you'." (Micro-Manager); "For the adult site, it was a little bit more difficult because sometimes when you asked the department heads, who should I be talking to about this issue? And it was like it wasn't always the same person that they would make available to you so it was very strange. They would have sometimes you go to the site Director at this site, next time he was too busy to see you and send you to another person. It was kind of like 'Okay, what do you want? What do you need?'" (Path-Tech1)
	Knowledge Spanners-in-Practice – Knowledge Broker
	Phase II: "Most of the time we were able to influence each other, arrive at a common, you know understanding." (Micro-Doc2); "Frequently I would be the mediator […] So if it doesn't have too many consequences, we have had to accept that the Paediatric will do something and the adult sites will do something different, just to keep it quiet." (Micro-Doc1); "My main role was […] to try to find a common solution." (CLab-Manager2); "We need to try to get people involved. I was helping [Path-Tech1] to push to do that." (Path-Doc1)

Fields of Practice

Phase I: As documented in the case narrative and in Table XVIII, the main reason for the implementation of the LIS project was to unify the three different sets of lab practices that were used at the three main sites, Downtown, Midtown, and Paediatric. The three set of practices were different because the labs from each site had different workflow procedures, used different methodologies for performing tests and patient admission sheets.

Phase II: Towards the end of Phase II, while the majority (90% according to Micro-Doc2) of the practices (lab protocols) were standardized across the boundaries between the three sites, the way the labs were managing the order entries was different between the Adult sites and the Paediatric site. Thus, at the end of the ISD it can be considered that the THC labs were presenting two fields of practice (Adult sites and Paediatric site).

Knowledge Complexity Level - High

Novelty:

Phase I: According to the case narrative and the evidence presented in Table XVIII, at the outset of the ISD project, the level of knowledge complexity was high at the boundaries between the three main fields of practice. First, some of the agents never met before; second, the coordination of the various groups was challenging due to the existence of different site-based interests; third, Sigma technology was new to all the project stakeholders.

Differences:

Phase I: The differences in knowledge of the others' practices at the beginning of the project were significant and presented challenges to the individuals engaged in the process of knowledge sharing. They "didn't have a clue" (CLab-Manager2) how different their lab workflows and protocols were from the others'.

Dependencies:

Phase I:

According to the case narrative and the evidence presented in Table XVIII, the agents realized that they will need to rely on the others to be able to configure the new LIS. The agents knew from the beginning that they were dependent on other team

members and available technical documentation, but they didn't realize the extent of this dependency. The physicians and the managers, members of the Clinical Advisory Committee, were dependent on the technologists' know how, some of the IS team members relied on the team's network specialists, and the Expert team members were dependent on a not so reliable technical documentation.

Type of Knowledge Boundary – Pragmatic

Phase I: The case narrative and the evidence presented in Table XVIII suggest an existing high level of knowledge complexity and different interests between the agents from the three main THC sites. The representatives of each site were trying to demonstrate that their practices were better suited to be incorporated into the new system functionality. They were basically defending their "kingdoms". Thus, it can be argued that the agents were dealing with a pragmatic knowledge boundary.

Phase II: The agents continue to face a pragmatic boundary. As documented in the case narrative, while during Phase I the agents identified the existence of different interests, in Phase II due to a change in the political context of the project, they had to find common interests between all the project stakeholders.

Knowledge Sharing Processes – Translation and Transformation

Phase I: According to the case narrative and the evidence presented in Table XVII, the agents realized from the outset that they had to deal with multiple understandings of the different practices and different interest among the agents (pragmatic boundary). But before embarking in negotiations of trade-offs, they started by engaging in a process of learning about differences in knowledge about practices and dependencies among them (*translation*). Not only the agents didn't have a clear understanding of the others' practices, but there was also some confusion among the members from the same site about some of their lab protocols. This was due to a lack of documented procedures and the most of the agents' knowledge was based on group or individual "knowing". Thus, the members of the Expert teams recognized the situated and interpretative challenge of managing knowledge across the boundaries and they sought to identify shared meanings of their practices. The members of the IS and Expert groups assessed during this phase in weekly meetings the existing site-based lab

protocols and workflows in order to understand what the needs of their respective user communities were. Once they identified common grounds, the agents were able now to find ways to mitigate the different interests that each of the site representatives had with regard to the future system functionality. However, at this stage the agents didn't want to negotiate common interests as everybody was defending its "kingdom".

Phase II: Due to increasing upper management pressure some of the agents realized that they must engage in some form of negotiation of common interests (*transformation*) by proposing trade-offs and agreeing to transform their knowledge. For instance, the agents struggled to come up with a unified nomenclature of their lab tests. Some of the agents had to agree to change test names they were using for years. Thus, during the weekly meetings that the IS and Expert groups would have with the one or more members of the Clinical Advisory Committee, the agents would try to identify and propose common interests to accommodate as much as possible the labs' staff requests by engaging in trade-offs, agreeing to compromises, or having to follow executive decisions when the common interests were not reachable.

Boundary Objects

Phase I: As documented in the case narrative and in Table XVIII, during Phase I the agents would meet in weekly working group meetings to try to identify shared understandings (translation process) about their practice. To accomplish this they used *structured documents* (ex. Solution Design Assessment documents, project status reports, Standard Operating Procedures with screen-shots) as main boundary objects and did follow-ups by *email* to clarify any unresolved issue at the end of these meetings.

Phase II: During this phase the agents had been provided remote access to a prototype LIS database (mock-up) by Sigma at its headquarters in USA. The prototype, as a boundary object in a transformation process, enabled the agents not only to verify their accumulated knowledge about the LIS, but also to organize simulation-based training necessary before implementing the real system in production. The prototype gave the agents the means to try on alternatives and create new agreements on how to share the knowledge at the boundary.

Boundary Spanners– Nominated and Boundary Spanners-in-practice

Phase I: At the outset of the ISD process, Clinical Advisory Committee decided that the collaboration and knowledge sharing process across the boundaries between the sites would be initiated and fostered by three *nominated boundary spanners* (CLab-Tech1, Micro-Manager and Path-Tech1).The role of these boundary spanners were to first try to establish trusted links across the boundaries between the fields of practice and then entice knowledge holders (physicians and lab technologists) to share their knowledge. The case narrative and the evidence in Table XVIII show that while CLab-Tech1 representative was successful, the other two boundary spanners, Micro-Manager and Path-Tech1struggled to entice people to share knowledge. The difference between them was that while CLab-Tech1 had a great technical expertise and knew the other site-based lab staff, the other two never met before some of the agents. According to CLab-Tech1, he was considered by the others a legitimate participant in the practices of the three fields. He had no problem to evolve from a *nominated* to a *boundary spanner-in-practice*. The other two spanners weren't that successful.

Phase II: Due to the increasing pressure from upper management to identify and apply common standards based on industry best practices and local needs, some of the lab physicians and managers (Micro-Doc1, Micro-Doc2, CLab-Manager2 and Path-Doc1) became *boundary spanners-in-practice* and acted as knowledge brokers.These agents tried to diffuse the "us-versus-them" attitude of most of the site-based Expert team members by either proposing trade-offs or taking executive decisions when the situation imposed.

Our data analysis suggests that there was a relationship between the planned PMI approach and the nature of the knowledge boundary. The case narrative and the evidence presented in Table XVIII show that THC management envisaged a *transformation* PMI approach. Due to the fact that they were facing a pragmatic knowledge boundary, the agents engaged in Phase I in a *translation* process (identification of shared meanings) that was followed in Phase II by a *transformation* process (identification of common interests and transformation of the side-based site knowledge) of knowledge sharing across the boundaries. To accomplish this, the agents used boundary objects during these processes that were appropriate for sharing

knowledge across a pragmatic boundary. Based on the above argumentation we posit that Proposition 1 is supported for Case 2.

Proposition 2: *Agents, as boundary spanners, will try to convert their accumulated individual capital (knowledge-in-practice at the boundary) into symbolic capital to make claims about who holds relevant knowledge and create a new model of practices that, when incorporated in the new IS, reinforces those claims.*

Valuation of the Individual Capital

Phase I: As documented by the case narrative and in Table XIX, during the first phase of the project, the agents spent their effort to collectively defend their "kingdoms" practices. Only one agent (CLab-Director) was noticed for his strong advocacy for developing a "perfect" system prior to implementation. While he didn't claim any "authoritative knowledge" he showed a strong adversity to the methods that the other agents were adopting for developing the new LIS and tried to slow down the ISD process by attempting to influence other agents.

Phase II: Only during this phase two agents (CLab-Tech1 and Micro-Doc2) took initiatives to influence the process of ISD. The evidence from the interviews (Table XIX) shows that these agents, acting as boundary spanners-in-practice, took advantage of their existing social capital and accumulated symbolic capital during Phase I of the ISD process to claim "authoritative knowledge" to legitimize new system's configuration (CLab-Tech1) or propose trade-offs or right down imposing executive decisions (Micro-Doc2) during meetings.

As documented in the case narrative and the evidence illustrated in Table XIX two agents, having the capacity of *boundary spanners-in-practice*, tried and succeeded in Phase II of the ISD process to exercise their accumulated symbolic capital to claim legitimate knowledge and change the model of practices that were built into the functionality of the new LIS. Thus, we conclude that Proposition 2 is partially supported for Case 2 (only for boundary spanners-in-practice).

Table XIX Case 2 Evidence (Proposition 2)

Concepts	Evidence
Valuation of Individual Capital	**Valuation of the individual capital of some of the agents**
	Phase I: "I mean you have different personalities and you have different perceptions and you have, you know you have different personalities, you have the ones that will not be afraid of taking a risk, you have those that will *never* take a risk no matter what… Because truly the person at the Midtown was – it was his personality, it had nothing to do with the knowledge that he had, he was extremely knowledgeable, he was just a person who won't take a risk going live. I mean going live is taking a risk, we knew that even if we had tested the system inside out as much as we thought we would that we would go in production and we would have problems. There are no systems going in flawless… So this person will try to influence the other one in saying '*until I know 100 per cent I'm not going to have any problem I'm not moving'* and he will try to influence the other ones. He'll come up with a list of things saying this is not perfect this is not…as much as you want to make it perfect it's never going to be perfect to what he wants it to be. It was the lab director [CLab-Director] at one site, the Midtown" (IS-Manager)
	Phase II: "Path-Doc2 he's very knowledgeable about what systems can do for us. He was very instrumental in getting us to go along that route. … he had a lot of knowledge about what was out there" (Path-Tech1); "If there are differences, she just says okay I chose this one. We have a very strong director in microbiology [Micro-Doc2] that just imposed it. People are not always pleased but she has had to force standardization because in microbiology we have what, probably 250 lab protocols and the director has had to force a lot to get some consensus." (Micro-Doc1)
Claims of authoritative knowledge	**CLab-Tech1 and Micro-Doc2 as Boundary Spanners-in-practice**
	Phase II: "It's probably because I could push it. I'd been in the business levels for a long time. I know the players. I know what they want. I mean the users. The physicians, the directors. If someone wanted to push something through, if they didn't get my blessing it wasn't going to" (CLab-Tech1); "They [Paediatric] don't know what's really important for Adults, that's why we had to meet almost every Thursday and we had to hammer it out sometimes. … I'm the only one that everyone gets along with (Micro-Doc2)

Table XX Case 2 Evidence (Proposition 3)

Concepts	Evidence
Initial functional design	**Reflects the Transformation PMI approach**
	Phase I: "Not only do they [management] count there going to start using the same system, but the system will work the same way for all of them. I mean, suppliers are not going to develop a specific need for a specific site. But will say -- you'll have to standardize your practices, your way of working across sites because we have one system for all sites." (IS-Manager); "At the beginning when I first got involved they [management and Sigma] said it was going to be 80% built by the vendor, like 80% ready and then we would only have to put in the 20%." (Path-Tech1); "They told us it was 80 percent built." (Micro-Manager)
Final functional design	**Different from the initial design, reflecting a mix of Transformation and Preservation PMI approaches**
	Transformation: "We had to develop new workflows. I think when you look at reengineering our department they looked at the best way of doing it... We had to standardize it so it would be the same across board." (IS-Manager); "Everybody is doing the same. Across the board. Even the Paediatric. They don't have the same prefixes but it's the same thing." (Path-Tech1); "I think the practices were reasonably uniform after the system was implemented. That certainly was achieved." (CLab-Director); "Sigma told us that the system would be built by themselves at a range of about 80%. We would have about 20% still. And when we would start to work, we, it appeared that it was the contrary. We had to build about 80% of the system" (CLab-Manager2); "We had to start from scratch even though they said 'well, a sodium is a sodium', there were some of them but a lot of them had to be built from scratch." (CLab-Tech1);
	Preservation: "[Paediatric site] didn't and still don't have order entry on the floors. So that's why they adapted what they're doing in the lab you know because they're getting the samples the same way as they always got them. They did not standardize the way they work to the way we work in the lab. The Paediatric is different" (CLab-Manager1); "We thought that there was one way of working with the system, common to all the sites. But ... we find out that some people were expressing their concerns about the functionality and we found out that there were some different practices ... workarounds depending on the problem." (CLab-Manager2)

Proposition 3– *The planned configuration of the IS that reflects practices related to a specific PMI approach may be different from the final configuration at the end of the ISD process.*

Planned IS Configuration

<u>Phase I</u>: According to the case narrative and the evidence in Table XX, the initial design of the LIS was supposed to reflect a unified set of practices based on THC upper management requirements and Sigma's approach to best practices. During the Phase I the initial configuration of the system didn't evolve much as two important issues emerged that slowed down the ISD process: first, the agents struggled with the acceptance of the idea of changing their practices; most of the agents were, as CLab-Tech1 describe, in a "retention phase", that is, they didn't really care about the others' practice, but only for their "kingdoms". Second, Expert and IS teams members were disappointed with the fact that they realized that the system was not 80% best practices-ready built as per upper management's and Sigma's claim, but in fact the reality was completely reversed – the agents found that only 20% of the system was ready. The initial version reflected a transformation PMI approach, but the technological platform proposed by Sigma was too restrictive and didn't have the level of configurability enough to implement new standards of lab practices and in the same time to accommodate local procedure contingencies that were discovered during the translation process of knowledge sharing.

Final IS Functionality

<u>End of Phase II</u>: Based on a completely new technological platform provided by Sigma and due to the efforts of the boundary spanners, the members of the Expert and IS teams had built a system which had a final functionality different from the original one. This configuration reflected a common main set lab practices (lab protocols) and was flexible enough to accommodate a number of "workarounds" necessary for some idiosyncratic procedures and the particular "order entry" procedure at the Paediatric site.

In conclusion, Proposition 3 is supported for Case 3. Our interpretation of the evidence is that even though the final configuration was different from the original one proposed by the upper management and Sigma, we could still find the initial PMI approach of *transformation* reflected in the final functionality of the LIS. While the initial design was based on Sigma's first technological platform and its approach to implement industry standards, the final configuration was based on a different platform and agents' approach to see best practices as being a blend of industry standards and local contingencies. Therefore, the resulted LIS functionality reflected a mix of *transformation* and *preservation* PMI approaches.

From a processual perspective, as illustrated in Table XVII, each of the three Propositions presented a temporal evolution throughout the two phases of the LIS development. The planned PMI approach of transformation created a pragmatic knowledge boundary between the project team members at the outset of the project (Proposition 1). To deal with the level of complexity of the knowledge at the boundary, the agents engaged in a translation process of knowledge sharing in Phase I followed by a transformation process in Phase II. Two different types of boundary spanners were used, one for each of the two phases: nominated boundary spanners in Phase I and boundary spanners-in-practice in Phase II. The difference was due to the unsuccessful attempt of the former to entice agents to share knowledge. Concerning Proposition 2, during Phase I (defence of the "kingdoms"), the agents engaged in processes of valuation of other team members' individual capital that resulted in the creation of symbolic capital that eventually was used by some of the agents to claim relevant knowledge in Phase II. The final IS configuration (end of Phase II) was different from the planned configuration (outset Phase I) as conjectured in Proposition 3. The configuration of the system evolved through several instantiations (minor and major revisions) during the two phases of the project reflecting the agents' reluctance to change their practices (Phase I) and the resulted trade-offs between boundary spanners and the rest of the agents (Phase II).

5.4.5 Inductive Analysis

Theme 1: "Us-versus-them". While everybody acknowledged and didn't contest the fact that the Paediatric site was different than the other sites, three agents (two representing Midtown, the third one representing Downtown) site engaged in a process of social reconstruction of the their field of practice by emphasizing the differences in practices, values and norms between their sites and tried to convince the other agents how much better one lab was than the another. According to CLab-Doc1, ("back in the good old days, when the Downtown and the Midtown, it was like two separate solitudes"), this animosity among lab staff goes back in time when the then two independent hospitals were competing with each other in terms of lab services offered to the city population.

> "The Midtown was always a more efficient lab of the three sites. That was the case when I started there. The lab always was a very efficient lab and I continued on in that practice also because I did not have any choice. I was the only Biochemist person in the lab. We didn't specialize too much in esoteric testing. The Downtown was very specialized in all kinds of esoteric testing. They were not as efficient as the Midtown was. I liked that culture at the Midtown. I didn't like the culture at the Downtown." (CLab-Director)
> "There was fight, people scream, that's what I know. They screamed because they're thinking that they are the best. People from the Downtown usually cry a lot. People at the Downtown will impose themselves. Because they are bigger, because they have more patients, so they always think that the lab at the Midtown is not as good as the Downtown, in fact, it's just the opposite." (Micro-Doc1)
> "When you talk to the Midtown people they will tell you they are the most efficient ones. Quite more efficient than the Downtown and at the Downtown the staff is no good, they don't know what they are doing, etc., etc. But so for them they're the best of the three sites." (CLab-Manager2)

The evidence points to the fact that the practices of symbolic "us-versus-them" were part of the ongoing "war" between the two Adult sites during the two phases of the project. The defense of the "kingdoms" in Phase I influenced the three agents to position themselves within a specific field of practice. Their collective representations shed light on the existence of a continuing struggle to impose one field as being dominant over and against the other competing alternative. The symbolic work of field representations suggests that the struggle to defend the "kingdoms" and the ensuing ISD process stale-mate during Phase I were the result of the agents' conviction that the existing boundaries between the sites couldn't be changed during the process of the LIS development.

Theme 2: Continuity of Pre-merger Organizational Identity. The field's identity is present in the interviewees' comments. Some of the agents saw the implementation of the new LIS as a means to reify their loss of organizational identity. They felt that by using the system they will eventually lose the control over the rules of the game within their respective fields of practice. Some of them felt like "immigrants" in an adoptive country. They were not comfortable engaging in a game based on unfamiliar rules.

> "They didn't give us a chance to mourn […]. We were losing the identity that we had as standalone areas" (CLab-Tech1);
> "It's always to be careful that it's not taken as a Midtown idea or a Downtown idea. You had to be careful you didn't say 'well you know at the Midtown we do it like this and it works, at the Downtown we do it like this and it works'. Industry standards this would be the better way to go" (CLab-Manager1);
> "The overall consequence from the point of view of the integration of LIS, was the loss of institutional identity […]. So as we went forward, the institutions started to lose their individuality" (CLab-Doc1);
> "You always recognize yourself with the site that you're at, but also being part of a bigger [entity], let's say you're an immigrant. You move to a place and you're part of where you are but you're also part of what you were as well."(Path-Doc2)

To resist the emergence of a new identity common across the site boundaries, the agents tried to perpetuate the dying organizational identities, even though in some cases this was counterproductive for everybody at the THC.

> "The culture within THC has always been five hospitals for them, and it's very difficult to be able, even at the level of directors, to make them understand that in fact when we compete against [other healthcare institutions] we need to work together. People know it, but people do not want to do it." (Micro-Doc1)
> "It was yet another culture at the Paediatric. We always joked about the argument 'we have a small sample size'. They often liked to be the exception from the rule and the argument always was justified that the challenges in a paediatric hospital are different. I mean there are smaller samples and diseases progress faster in kids so things are different." (CLab-Director)

The agents, representing the three different fields of practice, shared the same norms and values with others from the same field. Each field's identity was based on common beliefs about the value of their contextual practices, of what was "at stake". Thus, the evidence suggests that when the agents showed little interest in the "stakes" in the other fields, the ISD project didn't advance well (Phase I). In fact at the end of Phase I the project reached a standstill status. Only when pressured by the upper management and boundary spanners-in-practice (Phase II), had the agents to learn to acknowledge the rules of the other fields that eventually lead them to realize that trade-offs were available for them. Therefore, acknowledging what was "at stake" in the other fields was key to successful knowledge sharing across the pragmatic boundary.

5.5 Within-case Analysis: CASE 3 – The Clinical Display (CD – CIS)

5.5.1 General Context and Main Project Stakeholders

In the summer of 2004, the THC took another important step towards implementing its post-merger integration approach by signing the contract of collaboration with Delta, a major supplier of Clinical Information System (CIS) solutions. A CIS is a software application that collects and organizes information from various systems such as laboratories, the pharmacy, transcribed reports, and so forth. The CIS offers one-stop access to information on patients by centralizing all electronically available clinical data, regardless of its point of origin. A CIS constitutes a typical illustration of a configurable IS in the health care sector.

Five years into the post-merger phase, the THC was still relying on three old mainframe-based hospital information systems (HIS) to manage its clinical data. At the adult sites, even though the patient data were housed by the same HIS, the two database instances (Midtown and Downtown) were incompatible for data transfer between sites (each site using different types of patient index). In 2002, a rigorous CIS selection process was put forward. This process culminated in the selection of the CIS solution offered by Delta. The solution provided a flexible, open architecture design that enabled the creation of a comprehensive and unified patient record from multiple sources and bridged the gap between inpatient and outpatient systems. Delta CIS was the first commercially viable patient record solution based on a clinical data repository (CDR) designed to interconnect with other systems (in the case of the THC, all its ancillary systems). Delta CIS offered a Clinical Results Display that provided a unique "smart summarization" of all patient-related information. In addition, one of the key advantages of the Delta CIS was the Electronic Master Patient Index (EMPI). If a patient had a medical record number and various tests across sites, the EMPI could link these charts together, thereby allowing results to be viewed, regardless of location.

The link between the PMI approach and the initiative to implement a CIS is clearly reflected by the comments of some of the interviewees:

> "The premise was already known, communicated and understood by the organization. It was one of the THC's strategic goals: to install a unique clinical IS 'across-sites' that will integrate all patient data." (Clinical Analyst)

> "Certainly the CIS was an action following the merger. Of course we knew it would either facilitate or exacerbate all the effort that has been done in terms of harmonization." (Nurse2)

> "On the one hand, the THC is a reality, whether you have the CIS or not. So the commonization of practices had started to happen anyway. On the other hand, to have to work together on this common system and to achieve common screens, common forms, you sort of have to really review your practices, your processes." (Manager1)

> "When we talked about having a clinical information system, to me it was like okay this is an initiative that is going to be an THC thing, it's not going to be a Midtown, it's not going to be an Downtown thing, it's a THC thing." (Nurse1)

In a presentation to the THC management, the main goal of the new system was presented as being useful to clinicians to help them improve the quality of the healthcare services and better the communication between the different groups of health professionals (nurses, physicians, residents and clerks). Seen as the "project that will change our lives" (Management presentation January 2005), the THC and Delta decided to adopt a cautionary, phased, approach to implementing the CIS. According to CIS project documentation, this approach was structured to achieve the following three main goals: a) Show results incrementally throughout the course of the project; b) Achieve buy-in and transfer ownership of the solution developed to the clinical community; c) Introduce industry best practices for how patient information is viewed and/or captured gradually as opposed to all at once. To achieve these goals, the Company and the THC decided that the project would be conducted in 3 phases.

Due to this implementation approach, each of the three project phases has been considered as being a project in itself, with Phases II and III being dependent upon completion of the precedent phase. Considering this and due to the fact that Phases II and III were still in progress at the time of writing this case, we chose to focus only on Phase 1.

Phase I - The first phase of the project represents the Clinical Display (CD). The Clinical Display, which represents a series of screens, will display patient demographics and visits and clinical results. All of this information is sent from these respective ancillary systems (LIS, Pharmacy IS, Radiology IS, etc.). This phase's goal was two-fold: 1) to provide a single point of access to patient information; 2) to allow the IS developers to deploy interfaces and optimize the network infrastructure reliability in preparation for Phase II. The goal of Phase I is described by one of the interviewees:

> "It's like you got to walk, learn to walk before you run. You can't, that's exactly what it is. You cannot implement a system like that in one shot with all the features. You just can't. First of all, technologically you can't and the users, don't forget, you're talking about 2,000 physicians to train plus how many nurses…" (Manager1)

Phase I was completed in December 2008.

Phase II – This phase would test and adapt the remaining functionality (Order Entry Management, care planning and clinical notes for the most common needs of medicine and surgery) in a limited number of pilot sites (care units and outpatient areas). This phase was in progress at the time of writing with a target completion date at the end of 2010.

Phase III – This phase will consist of deploying the Physician Order Entry Management functionality to the entire organization, along with care planning and clinical documentation screens developed in phase II, in areas that can benefit from it. This phase has a target completion date at the end of 2011.

Prologue. According to the project documentation, the CIS provides, in the context of the THC as being a multi-site tertiary teaching facility, the functionality supporting: 1) one-stop, single point of access to the patient information across the THC sites; 2) the integration of care processes and continuity of care; 3) the health professional practice with clinical decision support tools; 4) Computerized Physician Order Entry with Rules-based Clinical Decision Support (CIS Project Definition May 2004).

We have broken down the four years of development and implementation of Phase I of the CIS project into two bracketed phases: Phase IA (July 2004 – May 2006) – Clinical Display development and Phase IB (May 2006 – December 2008) – Pilot Test and Roll Out. The bracketed project timeline is illustrated in Figure 5.

Due to the project's complexity, the THC decided to use a two-tier coordination structure: 1) The CIS Coordination Committee that had two main responsibilities: to coordinate all the elements pertaining to the development and implementation of the CIS at the organizational, technological and project management levels; to identify and mitigate the challenges and the potential risks related to the project. The team was composed of physicians and clinical managers. 2) The Clinical Working Group that had three main responsibilities: to configure and implement the CIS; to suggest to the CIS Coordination Committee any major change in the planned CIS configuration and propose user training strategies and to ensure that the system functionality follows the proposed design content. The team was composed of clinical representatives from various departments and services (e.g., Radiology, Nursing, Pharmacy, Surgery, etc.). Some of the members of the CIS Coordination Committee, especially the physicians,

were present at some of the Clinical Working Group meetings to provide design recommendations based on their specific needs.

Nine individuals, members of the two groups, who were the major stakeholders in the design and implementation of the CIS, were interviewed. The list of the interviewees is shown in Table XXI.

Table XXI CIS Team Project Composition

Function at the outset of the project	Group Membership	How they are referred in the text	Site (prior to the ISD project)	Background
Director of the THC Geriatric medicine	CIS Coordination Committee & Clinical Working Group	Physician1	Downtown & the two Specialty sites	Physician; Chief Technology Officer for the University Clinical Health Informatics Research Group
THC Head of the General Surgery dept.; Chair of the CIS coordination committee	CIS Coordination Committee & Clinical Working Group	Physician2	Midtown	Surgeon; Full Professor and Researcher at the Faculty of Medicine affiliated with the THC
Nursing IS specialist	Clinical Working Group	Nurse1	Downtown & the two Specialty sites	Nurse; Assistant Head Nurse; Extensive experience (over 20 years)
Co-chair of the CIS Coordination committee	CIS Coordination Committee	Nurse2	Midtown	Nurse; Patient Information Security specialist; Master degree
THC Clinical IS analyst	CIS Coordination Committee & Clinical Working Group	Clinical Analyst	THC	Paediatric nurse; Master degree; hired by the THC as a CIS analyst; over 15 years experience in clinical field
Paediatric Nurse Manager	CIS Coordination Committee	Nurse3	Paediatric	Nurse – extensive experience in Paediatric nursing
Member of the CIS Coordination Committee	CIS Coordination Committee	Physician3	Midtown	Physician; University professor - Associate Dean for Undergraduate Studies
Ambulatory services manager	CIS Coordination Committee	Manager1	Paediatric	Ambulatory services manager; bachelor degree; over 15 years work experience
Unit coordinator	Clinical Working Group	Coordinator1	Downtown & the two Specialty sites	Nurse; bachelor degree; extensive work experience (over 30 years)

Figure 5 Flowchart of the Bracketed Project Timeline

Management Actions			
Delta wins the bidding for the CIS project	Two-tier coordination structure is implemented: CCC + CWG	IS department leads the project	"Buy-in" PR to lay foundation for Phases II and III

Accumulation of symbolic capital

Negotiation of trade-offs

RFP released	Contract signed	Analysis, Design and configuration of the screens of the Clinical Display	Pilot test departments chosen	Pilot test implementation	Design and configuration of new screens	Clinical Display Roll-out

ISD Process

Spring 2004 — July 2004 — 2005 — Spring 2006 — May 2006 — July 2006 — 2007 — December 2008

Phase IA: Clinical Display Development – Sky is the Limit

Phase IB: Pilot tests and Roll out – Laying the Foundation

5.5.2 Phase IA: Clinical Display Development – Sky is the Limit (July 2004 - May 2006)

The CIS project displayed great complexity since the very beginning of its existence. Until signing the contract with the vendor in July 2004, this complexity was particularly evident not only within the THC's organizational boundaries due to the still exiting different site-based cultures and practices but also due to a lack of upper-management experience on how to manage such a large IT-based clinical project. According to one of the agents, from the outset, the project was led by the IS department and the focus was on the technical aspects of the implementation, with organizational/clinical issues being overlooked.

> "They [THC upper-management] were not ready to take on the leadership of this type of project. That was my feeling as co-chair. It's like at the THC they didn't realize that it was their project and not an IT project. And that was beyond my control and the control of a lot of people. Yes we have a clinical champion, but a clinical champion cannot do it all. Above him and around him at the senior management level they had to realize that you know, it had to be a THC project and not an IT project. The THC will lead the IT project. IT is there only to support." (Nurse2)

> "[Physician1] indicated that the role of the Clinical Informatics group should be to maintain the content of the CIS. This is the group that will establish the set of rules for the CIS. The CIS is only the tool. This should be a group with dedicated funds and time to maintain the clinical content of the CIS." (Minutes from the CIS Coordination Committee Meeting, March 2002)

Once the contract with Delta was signed, the Clinical Working Group started to meet on a weekly basis to identify the requirements specified in the contractual statement of work. The purpose of this assessment was to ensure that there was a common understanding of the requirements levied on the Delta team by the contract and an agreement on how these requirements would be addressed at a conceptual and then at detail levels. At the detail level, the Clinical Working Group members worked with the Delta developers for information gathering on the different ancillary systems (ex. Radiology, LIS, etc.) for each CIS interface. The process involved getting screen shots from the different ancillary systems, documenting the present workflow for those areas and reviewing any existing documentation from these ancillary systems.

The deliverables for Phase IA (Clinical Display) were the following screens:

Screens	Content
Patient rosters	Lists of patient population by type of medical practice
Demographics	Visit history and appointments
	Lab results
	Radiology reports and image viewing
	Pharmacy profile
Transcription reports	Operating room
	Consultation notes
	Discharge summary
Paediatric resuscitation sheet	Emergency procedures, medication and necessary equipment

Thus, the main role of the Clinical Display was to provide screens containing consolidated and centralized patient information received from various clinical information systems regardless of its point of origin. Basically, the Clinical Display was supposed to bring information, scattered across the THC sites, to one central access point in front of any THC caregiver. The importance of the implementation of the CIS in a transitional environment such as the post-merger phase of the THC is illustrated in some of the interviewees' comments:

> "There is the objective in the clinical information system to centralize all sites into a single tool, a way to query and to enter, communicate, and manage the information […] the ability to gather data from different sites as well, for the same patient, centralized in a system, so that the Midtown clinic can also get the information on what is going on at the Paediatric, at Downtown, etc., so it is obvious that among the objectives, it's to standardize the information, the way to use it and the way to redirect it, to spread it in the entire organisation." (Clinical Analyst)
> "We'd buy one system that would fit for everyone or everyone would use, one common system instead of having our separate systems, because trying to have all the data together would, you know, connecting it all was difficult because everybody had different systems." (Nurse1)

Even though the assessment of the requirements and the configuration of the interfaces between the ancillary systems and the CIS seemed to be a straightforward process, soon the group members realized that, due to the differences in practices between the three main sites of the THC, they would have to clearly evaluate the system's limits of configurability versus clinicians' expectations. Clinical Analyst describes this situation in her interview:

> "We cannot go to the clinicians and say, what do you really want since 'the sky is the limit'; so we started from our own understanding of what information should be pushed into the CIS and from there, how could we display it on the screens and that was the mandate of the clinicians." (Clinical Analyst)

Three different ways of engaging in practices of patient information management were present at the THC. The Paediatric site was clearly differentiated from the adult sites,

while the Midtown and the Downtown sites were also seen as different because of the different workflows within the sites due to the existence of different ISs.

> "I would say the difference is, well the Paediatric is different from everything […] So the Paediatric really counts almost as a block. Whereas in the adult sites, each individual clinical group kind of counts as their own area if you want. So for example, I would say Psychiatry versus Surgery versus Orthopaedics have drastically different ways of going through their workflow and looking at results. The workflows are different. The Midtown PCS is not on the Downtown PCS and you couldn't follow patients across both sites. There were separate windows that had to be opened." (Physician2)

At the outset of the project the members of the two main groups were confronted with a new technology (CIS) and were supposed to collaborate with people that they never met before.

> "There were of course a lot of new people to meet or to know because we were getting all the sites together." (Nurse2)

They were also surprised to find out how different their practices were from the others' and how much they would need everybody's input in order to advance the project.

> "It's certainly an issue, I remember people being surprised of the other practice; oh that's the way you're doing? You know. So no, I don't think they knew." (Nurse2)
> "So that we were meeting before we had the meetings with the physicians and the other groups, and I asked Clinical Analyst to help me because I was, you know, out of my depth at that point, I was very new to informatics, about what it is that we needed to discuss and talk about and that's when we talked a lot about okay at the Midtown this is the process this is what I would do as unit coordinator, this is what I would do as a nurse. With each of the sites giving their input and saying okay what's the same? What's different? (Nurse1)
> "We had some group who were able to identify what they need. However, their resources were not available for them because they have not been planned for because we didn't know about the project." (Nurse2)
> "I don't think they [group members] were aware of their dependencies." (Physician1)
> "It was very evident to me when I was chosen to be the rep here that I was going to need a lot of input from very well versed nurses on many different items." (Nurse3)

During Phase IA (Clinical Display), the members of the Clinical Working Group would sit in weekly meetings. The analysis and design stage, prior to the "screens built" phase of the system, would involve reaching a "fit" between the level of system configurability that Delta developers were able to provide and what the group members would like the new system to be able to do. These meetings had the format of a half a day workshop. In order to collaborate, at the beginning, the individuals used paper documentation such as The Data Repository specifications and the Project Design document. The former described how Delta CIS would store data that would be transmitted from each ancillary system. Then the group members started using "screen shots" which they found helped their knowledge sharing process become more productive. Finally, Delta

gave the group members access to an online prototype system in which the team members were able to manipulate dummy patient data and achieve basic "hands-on" experience with the new IS.

> "We started with the meetings that we had, you know, we were looking at things on paper, people said well this isn't good enough I need something more visual. So then they started showing things, PowerPoint presentations and things like that […]. So eventually they [Delta] were able to give us access to the model environment [prototype] so that we could play with it. They put in some dummy data and stuff in there so you could go in and we could look at the information and navigate around in the system so that people would have a feel for it." (Nurse1)

To advance the project, team members tried to find common ground to configure the first Clinical Display version. Due to time restrictions, the group members realized that they would not be able to individually approach every departmental representative, so they decided to adopt a controlled knowledge sharing process. They would ask the site representatives to bring concrete propositions of screens outlook reflecting their department's needs to every meeting. Once all these propositions were discussed, two or three options were proposed with one final version being adopted based on consensus. This process of achieving consensus is illustrated in the comments of the interviewees:

> "In phase 1, when we talked about the developments and the decisions regarding the information display, well, when you talked to people from Downtown, Midtown, or Paediatric, spontaneously, people were addressing different needs but ended, while chatting, to recognize that, 'I was asking for that, you were asking for that plus something else, well, we go midway' and we finally agree on what should be a standard to everybody."(Clinical Analyst)

> "Yeah, I think that the physicians, the clinicians that were part of the work groups were already convinced on the value of going this way and we were the champions. So we were going to see past the inter-site process differences and try to get down to the things that really make a difference and come to a consensus on it as quickly as possible." (Physician1)

For example, one of the main deliverables of Phase IA, the Patient Summary Screen, which was represented by four screens, Patient demographics, and Pharmacy profile, had as a role to help the clinicians increase their workflow efficiency in a dramatic fashion. However, to achieve this, the individuals had not only to understand the others' practices, but also to deal with several different political and professional viewpoints within the team.

> "Because it was going to be mostly results display and it was for them [physicians] to be using that first part more than the nursing was, let them have it the way they want because this isn't where we should put our emphasis on it because you know, we can live with it whichever way it is. That kind of thing about the change and how the display

is going to be would come later, when there's more stuff that nursing was going to be involved in, entry and stuff like that. So it's like okay you have it your way now because later on then we will really push our [nurses] opinion." (Nurse1)

"Sometimes it's frustrating because my God you know, if you're three people around a table agreeing but you've got two others who are not then, then instead of moving forward well you have to argue and say why can't it be that, oh, but that's working in a group in a big organization." (Manager1)

Even when the CIS Clinical Committee had to decide which departments would to be designated as pilot sites, further political negotiations were in the cards.

"So when it's time to talk about pilots, oh let's pick this and that and that. And you can see around the table people are reacting like why would we pick that unit? It doesn't make sense. So, and that gets very touchy because that's where the politics get involved." (Manager1)

"It was a competition, but a friendly competition because one of the pilot sites happened to be Physician2's transplant service. Like pushing a political agenda, I mean that's like in your face right and we agree right. And since that service happened to be at the Downtown then the next one politically had to be at the Midtown. So yes, those things did come through and then I said okay I'm a medicine representative how about 15, you know, medicine at the Midtown and they said, well it's too big and too complex." (Physician1)

The CIS represented (at the time of this writing in spring 2010 CIS design and implementation were still a work-in-progress) for the THC the IS that would enable a real clinical PMI across the sites. Due to the political sensitivity of the system, upper management had decided to involve some of the most influential professionals working for the THC in the project's coordination. Some of them were already well known to the hospital community, others didn't lose much time impressing the group members around the table.

"Some of the members of the workgroup were already spanning boundaries because if you look at labs and managers that were involved or service managers, they were already responsible for cross sites. So over the past maybe six to eight years before the start of the workgroup they had experience in trying to manage things across sites. So the people who came to the workgroups already had awareness and perhaps had implemented things in their domain that spanned those physical boundaries." (Physician1)

"I think the person that was listened to the most by everyone around that table and it was a pretty big group of people, was Physician1. I think he was the most influential. If I had to choose anyone that's the person I would choose yeah. But IS-wise, I felt snowed under sometimes because for instance Physician1 was there and not only is he a clinician but he's extremely IS-oriented so when he spoke I found it extremely interesting and I was able to understand what he was talking about because he was putting the clinicians point of view in the format of the informational systems […]. Clinical Analyst, she was key because she was a nurse. So she was very able to bridge where we were coming from, from the clinician point of view. So that clarified a lot of things for us, you know like Clinical Analyst was pivotal as far as, you know you asked

about influential people in the past, she was the liaison really between nursing clinic, clinical things and the IS yeah." (Nurse3)

As seen from the above comments, these group members were considered as being able to cross boundaries between sites and help advance the ISD process. Some of these individuals were aware of their reputation and were recognized for their expertise among the members of the hospital community. This fact is illustrated in the comments of two of the interviewees:

"Myself being a THC director and having to be aware of the differences and nuances between the Downtown and Midtown and how we do things even in my division, we had to bring that to the table." (Physician1)

"My goal was to carry the patient safety flag and really what will be the greater good for the institution." (Physician2)

At the outset of the project it was anticipated that a first draft of the design of the Clinical Display would be ready by the end of 2004 and a production version would start being implemented in 3 pilot departments each at each main site of the THC (Midtown, Downtown and Paediatric) by mid-2005. However, budgetary constraints triggered important delays. Finally, the pilot test was ready to start in May 2006.

5.5.3 Phase IB: Clinical Display Pilot and Roll Out – Laying the Foundation (May 2006 – December 2008)

The CIS Coordination Committee decided that the pilot phase would be implemented in three different departments, one in each of the main THC sites: Surgery and transplant department (Downtown); Neurology (Midtown); and Paediatric surgery. During the summer of 2006 the Clinical Working Committee members spent a lot of time at the Pilot sites to receive feedback from the users. The following months, based on the feedback received, they provided recommendations to the Delta developers on how to solve some issues related to or how to improve access to the clinical information provided by the Clinical Display. At the same time, the group members started the design of additional screens. These new screens were fed with information from the following ancillary IS: Blood bank; Operating Room schedule, Emergency room IS. Also, the Enterprise Master Patient Index functionality was introduced which was supposed to bridge the same patient information situated on different site-based indexes.

While in Phase IA, negotiation discussions among the group members had, as a goal, to make content all the stakeholders in terms of information accessibility within the screens in the Clinical Display, in Phase IB, especially during the pilot test period, the trend continued but it was more oriented toward pushing personal agendas, for instance some functionality of the CIS not necessarily seen as necessary by the rest of the group members. Some of the agents took advantage of the pilot test to try to persuade department representatives to accept new functionality by providing incentives.

> "Yeah, a bit of negotiation. Sometimes we did need to negotiate. Well one thing that we said we would use which we didn't use for example was the issue of biometrics. I had biometrics [functionality] of in my back pocket in order to buy people in. So to encourage people's buy in a certain screen that might have been difficult to get to, not quite what they wanted because some of the screens are dependent on what's available in the program. Some of this program will only become available during a later release. What we did at the pilots, people where we were developing the screens we did allow them to have a little more hardware, than we would have otherwise. And we told them listen you know, if you agree to be, so that we could get their feedback and we could, you know, sit down with them more than we would at large. So, to make sure that the proof of concept was there." (Physician2)

In September 2006, the conclusions regarding the outcomes of the Pilot test were presented to upper management. A list of issues and the propositions of how to solve these issues were advanced. Most of the issues were considered important but not essential, however some of them were considered to be "show stoppers". In those rare instances the group members had to strike a compromise between the needs of the respective department, the level of configurability of CIS and the contractual conditions agreed upon with Delta.

> "They had to compromise and say yes for your service you want something over there but for the rest of us it's like ... you're using up real estate where I can have something more than I wanted to see. […] So then there would be the debate back and forth between the clinicians and the vendor because they were saying well maybe that's what you have the system but it doesn't work for me and it's not going to work for us. So that's where I started hearing the words "show stopper". That's it because actually Clinical Analyst wanted to say, "Is this a show stopper? Is this going to stop people from using the system?" And they'd say, "Yes, okay well how are we going to get around it? How are we going to deal with it?" (Nurse1)

Despite its expected high level of configurability ("we'd buy one system that would fit for everyone" - Nurse1), the implementation of the Clinical Display constituted a complex process. This was due to both the configurable character of this technology, and the difficulties inherent to the re-thinking of local contingencies when looking for the adequate fit between technology and the organizational context.

The CIS didn't bring fundamental changes to the clinical practices. However, on one hand, the fact that now the nurses had to work with only one system instead of several ancillary systems to access the patient information constituted a major change in their workflow. On the other hand, for the physicians the Clinical Display was providing a single point of access to enhanced patient information, a sort of "best of all worlds". Now the physicians were able to have access to comprehensive clinical information from all sites regardless their physical working place (clinical practice of a significant number of THC physicians involves a multi-site rotation patient consultation). This is illustrated by the comments of the interviewees:

> "The personalization of the system I think is a very important part of the implementation and we spent quite a bit of time in the work groups figuring out what people wanted to see as functionalities. We had long lists of functionalities and then we had, you know, screens made based on those functionalities. We basically told people what do you want, we figured out in a list what they wanted, we went out and got a system that did, that gave them that and then we basically put in screens, the work groups put in screens for themselves what they wanted from the system."(Physician2)

> "Well, not when you are in 'result display' mode, because your practice of medical care doesn't change. What changes is your way of looking for the information. The clinical practice doesn't change but it's true that you look for advantages in that system because in the other one [legacy system], you don't have to look in two or three places anymore, you have it centralised." (Clinical Analyst)

Epilogue. Phase I of the CIS project was completed in December 2008. At the time of the writing (Spring 2010), Phase II was underway and the first Pilot tests were finished at the end of 2009. In an April 2009 presentation to the upper management it was shown that the THC clinicians were slowly but steadily accepting and using the new IS. While in February 2008 there were approximate 700 nurses and 250 physicians, in February 2009 there were about 1200 nurses and 450 physicians using the CIS.

5.5.4 Deductive Analysis

For THC upper management Phase I (Clinical Display) of the CIS project had as a goal to change practices of patient information management and laid the foundation for Phases II and III that will fundamentally change clinical practices. The Clinical Display was configured and implemented across all the sites over a period of four years. A high level of configurability of the Delta technology and boundary spanners'

actions made the Clinical Display reflect a PMI approach of transformation. Our analysis is synthesized in Table XXII and the evidence is illustrated in Table XXIII (Proposition 1), Table XXIV (Proposition 2) and Table XXV (Proposition 3). We pursued the same approach used in Case 1 and 2, that is, the analysis of the three Propositions was broken by phase of the project.

Proposition 1: *The planned PMI approach will shape the nature of the knowledge boundary between the fields of practice concerned by an ISD, thus creating demands on the types of knowledge sharing processes and boundary objects that the agents involved in an ISD will require for adequate knowledge sharing, as well as on the role of the boundary spanners.*

As documented in the case narrative and in Table XXII at the outset of Phase I there were three fields of practice: the Midtown, the Downtown, and the Paediatric. The evidence pinpoints to a pragmatic knowledge boundary at the beginning of the project. In fact, the level of novelty was high due to the fact that most of the agents never met each other and the CIS, conceptually and technologically, was completely new for the majority of the team members. The novelty generated the need for dependencies among the agents and in addition to that, different but not divergent interests of the agents emerged. The differences between agents' knowledge about the others' practices were also significant. The agents decided to first identify common understandings about their practice and then proceed with the development of common interests to propose a Clinical Display version that would satisfy everybody's needs. During the process of translation followed by a process of transformation, the agents engaged in knowledge sharing by using boundary objects such as standardized documentation (technical documents, emails) and prototypes. Boundary spanners took on the role of knowledge brokers. This involved mediating the knowledge sharing practices across the boundary and negotiating trade-offs by providing incentives.

Table XXII Case 3 Analysis

	Phase IA	Phase IB
Fields of practice	P1: At the outset - *Three*: Downtown, Midtown and Paediatric Inductive: Pre-merger organizational identities still present	P1: Outcome – *One*: THC - A common set of main practices (ways of accessing patient information)
Knowledge complexity	P1: *High level of complexity* - At the outset the agents were not able to correctly assess the differences in knowledge; they didn't know ho much about dependencies; high level of novelty	
Type of Knowledge Boundary faced by the agents	*Pragmatic boundary*: High level of novelty caused different interests between agents that limited their capacity to correctly asses and share knowledge at the boundary.	
Knowledge Sharing (KS) process	P1: *Translation* (group members needed to establish shared meanings) to establish efficient collaboration and build a first version of the Clinical Display ready for the pilot test followed by *Transformation* (needed to develop common interests and trade-offs between project stakeholders)	P1: *Transformation* (needed to convince department representatives to become champions, to buy-in the CIS)
Boundary Objects	P1: Technical documentation; Mock-up screens; Prototype (on line database with fictitious patient data)	P1: Prototype (on-going development)
Boundary Spanners	P1: Boundary spanners engaged in knowledge brokering and trade-off activities at the boundary	P1: Boundary spanners engaged in trade-offs at the boundary by pushing personal political agendas by providing incentives
Individual capital	P2: A number of group members were highly regarded by the rest of the project stakeholders as being "the pillars" of the project. One of them claimed authoritative knowledge to legitimize system's configuration Inductive: Group members representing Paediatric and Downtown sites engaged in symbolic discourse of "us-versus-them" by emphasizing the differences in practices between the sites	
IS design functionality	P3: Initial – Initial configuration proposed by Delta represented a backbone based on industry best practice standards on which the developers build the Clinical Display by taking into consideration most of the user representatives' requests(*transformation* approach)	P3: Final – Reflected unified practices based on industry standards and best-of-all practices from all sites (mix of *transformation and symbiosis* approaches)
Translation **KS Process** **Transformation**		
Symbiotic **PMI Evolution/phase** **Transformation**	Intent	Intent
Symbiotic **PMI Evolution/project** **Transformation**		

Table XXIII Case 3 Evidence (Proposition 1)

Concepts	Evidence
Fields of practice	**3 Fields of practice: Midtown, Downtown and Paediatric**
	Phase IA: "If you looked at inter site between the Midtown and the Downtown adult sites, they had different chart structures, different admission sheets" (Physician1); "We don't work the same at all. The Paediatric, they weren't computerized either" (Coordinator1); "It was clear that we were working in two different cultures [adult sites and Paediatric site] because the 3 major sites had different workload systems, even the information system that we were using, our Legacy System [PCS], was built differently so the way things were functioning and working with it was different" (Nurse1); "The Paediatric is quite different from the adults. The workflows are different" (Physician2); "The Midtown, the Downtown and the Paediatric have different patient index. I mean you can talk mergers and integration and being one happy family, OK? Bottom line, when you're sitting down you have different systems and that introduces a whole level of interface issues and stuff that you know, that the front end users don't see" (Manager1)
	End of Phase IB:"When you are in 'result display', your practice of medical care doesn't change. What changes is your way of looking for the information […] The objective in the clinical information system was to centralize all sites into a single tool […] the ability to gather data from different sites, centralized in a system, so that the Midtown clinic can also get the information on what is going on at the Paediatric, at Downtown, etc., so it is obvious that among the objectives, it's to standardize the information, the way to use it and the way to redirect it, to spread it in the entire organisation" (Clinical Analyst)
Level of knowledge complexity	**Difference is high**
	Phase IA: "It's certainly an issue, I remember people being surprised of the other practice; oh that's the way you're doing? I don't think they knew, we knew from each other's sites so certainly it's been a learning curve there. I remember the Clinical Analyst coming back from meetings and say you know, we spent a lot of time just having the people talk about the way they did practice on each site." (Nurse2); "They didn't know in the beginning. I think, you know, because there was a lot of unknown because within like the nursing group type of thing, there's not the same kind of crossover. Like some of the physicians may have worked in the different hospitals because either as a resident trainee or things like that, they circulated potentially more around the institutions then knew some of the differences. But within the nursing departments some of the representatives I've had worked forever on the same floor so they didn't even some time know how things worked in some of the other units." (Nurse1); "I didn't know the differences but I did know it was different, yes" (Coordinator1); "So from the Paediatric point of view people were very surprised that, for instance, allergies and risk items for Paediatrics were so tightly controlled here. We had massive dossiers and lists of things that in the Adult world it's important but you can ask an adult are you allergic to ampicillin; you can't ask a two-year old that. […] I knew that Paediatrics had its unique issues." (Nurse3)
	Dependence is high
	Phase IA: "So initially it was like okay who are my contacts going to be? And so that's when we identified and then we said okay let's all go to the meetings then because we said things are too diverse for me to say okay I represent the whole institution as one person. I said we need to have the different perspectives so we wouldn't have that "oh well no one ever asked me" mode afterwards" (Nurse1); "It was very evident to me when I was chosen to be the rep here that I was going to need a lot of input from very well versed nurses on many different items and I handpicked the people that I needed for different stages of the game so to speak" (Nurse3); "I don't think they [team members] were aware of their dependencies." (Physician1)
	Novelty is high
	Phase IA: "There were of course a lot of new people to meet or to know because we were getting all the sites together. It was new at the beginning." (Nurse2); "I think the technical vendor's occasional reality checks were very helpful. For the rest of us since no one really had deep experience within a complete integrated system, we were just trying to, you know, blue sky and see what it is we really wanted to get out of it" (Physician1); "It was very novel. I remember that I was invited, I had a couple of days training to understand what the CIS was, you know, as a system, what the possibilities were." (Nurse1)

Concepts	Evidence
Knowledge sharing processes	**Translation**
	Phase IA: "Spontaneously, people were addressing different needs but ended, while chatting, to recognize that, 'I was asking for that, you were asking for that plus something else, well, we go midway' and we finally agree on what should be a standard to everybody."(Clinical Analyst); "In the prep meetings it was always okay here's the issue that we have to talk about, you know, and go through the topic and say okay what's your feedback? What's our position? And we'd come to a consensus about what our position should be." (Nurse1); "I think that the physicians that were part of the work groups were already convinced on the value of going this way and we were the champions. So we were going to see past the inter-site process differences and try to get down to the things that really make a difference and come to a consensus on it as quickly as possible […] So if there were differences we would discuss everything and say, what are absolute commonalities and what's the best way to proceed to reconcile those differences […] I think there was more an understanding of the differences and where we got value from the system showing us information because if a clinician had never interacted with a computerized information system they want everything and then when we put it into the context of a roster and details came and all that stuff all of a sudden they realized they were getting too many bits on the screen and they can't find the information through all the data, so then they come to the realization saying I want to keep it simple and I want to have information here, and if I really want the details I drill down to another page. Once they got that concept it was easy." (Physician1)
	Transformation
	Phase IA: "So there's a lot of discussion about okay what's 1-2-3-4, so they had to compromise and say yes for your service you want something over there but for the rest of us it's like ... you're using up real estate where I can have something more than I wanted to see." (Nurse1); "I think that when we first started talking about how we wanted the screen to look, from a clinician point of view we knew okay this is what is necessary to have in it. There was a lot of negotiation on that too between the adults and the Paediatric and of course the company, there were some things that we couldn't change." (Nurse3); "Sometimes it's frustrating because my God you know, if you're three people around a table agreeing but you've got two others who are not then, then instead of moving forward well you have to argue and say why can't it be that, oh, but that's working in a group in a big organization. […] So when it's time to talk about pilots, oh let's pick this and that and that. And you can see around the table people are reacting like why would we pick that unit? It doesn't make sense. So that gets very touchy because that's where the politics get involved." (Manager1)
	Phase IB: "Sometimes we did need to negotiate. One thing that we said we would use which we didn't use for example was the issue of biometrics. I had biometrics [functionality] of in my back pocket in order to buy people in. So to encourage people's buy in a certain screen that might have been difficult to get to, not quite what they wanted because some of the screens are dependent on what's available in the program. Some of this program will only become available during a later release. What we did at the pilots, people where we were developing the screens we did allow them to have a little more hardware, sorry, than they would have otherwise." (Physician2); "It was a competition, but a friendly competition because one of the pilot sites happened to be Physician2's transplant service. Like pushing a political agenda, I mean that's like in your face right and we agree right. And since that service happened to be at the Downtown then the next one politically had to be at the Midtown." (Physician1)
Boundary objects	**Standardized forms (technical doc, email)**
	Phase IA: "We started with the meetings that we had, you know, we were looking at things on paper, people said well this isn't good enough I need something more visual. So then they started showing things, PowerPoint presentations and things like that." (Nurse1); "We were working a lot with screen-shots, paper and in PowerPoint" (Clinical Analyst); "I used email. I remember I had my email grouped to the group of the nursing group […] occasionally we would get emails from physicians [that] had a point and they wanted to email brainstorming type of thing where you'd get email circulating about, 'I haven't thought about this, what do you guys all think?' type of thing" (Nurse1)
	Models (Screen-shots; Prototype)
	Phase IA and IB: "We mostly used a combination of static screenshots and mock ups; they were mock up models that had some

Concepts	Evidence
	functionalities, minor functionalities that Delta brought to us […] So Delta would always have their laptop and project a roster and bring us through the first level functionality they thought of after reading our documentation and they had given us screenshots to prepare us beforehand what we would end up seeing and then we would discuss whether that was close to or nowhere near what we thought we had expected. So it's validating their functional requirements." (Physician1); "They [Delta] were able to give us access to the model environment [prototype]. They put in some dummy data so we could look at the information and navigate around in the system." (Nurse1)
Role of Boundary Spanners	**Nominated Boundary Spanners – Knowledge brokers**
	Phase IA: "And I always felt like I had to be a cheerleader it's like, you know, we're going to have this new system and, you know, be very upbeat about it (laughter) because it's like okay I had to drive these people in and have some enthusiasm" (Nurse1); "It was more a guardian kind of thing, to ensure that people always had the two worlds [Adult and Paediatric sites] in their head when they took a decision" (Clinical Analyst)
	Knowledge Spanners-in-Practice - Pushing political agendas, CIS Salesmen
	Phase IB: "I remember the chair of the committee saying, bringing information to the committee saying doctor so and so has told me about this and whatever, whatever and he's got this on the side and whatever and we absolutely have to include this okay. So yeah, there was a vested interest in some parties to make sure that certain parties got what they needed for sure." (Nurse3); "There are places like the Paediatric where the current they have now offers more than the system that we're giving them. Because ultimately the system we're giving them will offer them more, but it's a phased approach, it'll take time to get there. And so in those cases we have to rally them around the greater good of what's going to happen later" (Physician2); "It was to sell the pros of the CIS in a context where is was the effort of learning the new system versus the comfort that people had with the PCS [the old HIS]; some of the people had difficulties with it … you know, we had to work hard on those people in order to make them … 'convert themselves' to the CIS, so we knew, as a team project and then as sponsors, our Physician2 and the others from the project, that we had to kind of sell the thing, to sell the product Delta" (Clinical Analyst)

Fields of Practice

<u>Phase IA:</u> The evidence presented in Table XXIII shows the existence of boundaries between the three main *fields of practice*, Midtown, Downtown, and Paediatric at the outset of the ISD project.

<u>End Phase IB</u>: While the users of the new system didn't change their clinical practices, they completely changed how they accessed and managed clinical information. The physicians were able to access all patient-related data from a central point of access and nurses were capable to consult complementary patient information that was available before only by accessing different ISs.

Knowledge Complexity Level - High

Novelty:

<u>Phase IA</u>: According to the case narrative and the evidence presented in Table XXIII, overall the team members found that the context surrounding the ISD process had a high level of novelty. First, all of the agents were facing a completely new technology. Second, most of the agents were meeting people that they had never met before. Third, the agents were carrying with them their own field of practice's norms and values.

Differences:

<u>Phase IA</u>: At the outset of the project, the group members realized that there were significant differences in knowledge bases among themselves about the others' practices and they were not able to correctly assess these differences. As documented in Table XXIII during the first few meetings the agents spent their time to just talk to others and try to explain their daily practices. These differences were more specific in the case of nurses than in the case of the physicians. While some of the physicians were working on a rotation basis throughout the THC sites, most of these nurses had worked all their professional life only on one ward, so they were surprised to find out how differently their colleagues from the other sites were accessing basically the same type of clinical information.

Dependencies:

<u>Phase IA</u>: According to the evidence presented in Table XXIII, the agents realized that due to their differences in their understandings about practices they will have to

depend on the other team members. However, while they were aware of the need for dependencies, the agents had a hard time at the outset to identify the persons that they will have to rely on for advancing the ISD process.

Type of knowledge Boundary – Pragmatic

<u>Phase IA</u>: The case narrative and the evidence pinpoints to the existence of a pragmatic knowledge boundary at the outset of the project. Not only the level of knowledge complexity was high (levels of novelty, differences and dependencies were high), but also different interests among the agents emerged. Each of the representatives of the site-based departments and services physicians was there with a clear goal in its mind, to make sure that its community's needs would be taken into consideration during the CIS development process.

Knowledge Sharing Processes – Translation and Transformation

<u>Phase IA and IB</u>: Case narrative and the data from the interviews (Table XXIII) show that facing a pragmatic boundary, the agents had to engage first in a translation process of knowledge sharing in order to establish common meanings about practices and only after that they were able to deal with the different interests among the team members regarding the Clinical Display configuration. Towards the end of Phase IA, the negotiation of trade-offs among the agents generated frustration especially when the management had to decide which departments would be designated as beta pilot environments. Everybody wanted to have his or her department designated as a showcase for the new technology within the THC.

<u>Phase IB</u>: During this phase the pilot tests were undertaken at specific site-based departments. The trade-offs involved the negotiation of additional functionality (ex. biometrics) between certain physicians and the representatives of the user communities.

Boundary Objects

<u>Phase IA</u>: The evidence in presented in Table XXIII shows that during the Clinical Working Group meetings the agents used boundary objects such as, *structured documentation* (technical documentation and screen-shots) and did follow-ups by *email*

to share knowledge. These boundary objects facilitated the agents' learning process about the differences in their knowledge of the each other practices.

Phase IB: In the later stages of development during Phase IA and then throughout Phase IB, the agents used the prototype provided by Delta. The prototype, as a boundary object in a transformation process, enabled the agents to verify how far they were in providing a final version of the Clinical Display. The prototype gave also the agents the means to identify new trade-offs at the boundary.

Boundary Spanners – Nominated and Boundary Spanners-in-practice

Phase IA: According to the case narrative and the evidence in Table XXIII, at the outset of the ISD process, upper management decided that the knowledge sharing process across the boundaries between the sites would be fostered, with the exception of Clinical Analyst, by several agents that were influential within their fields of practice (Physician1, Nurse1, and Nurse3). We consider them as being *nominated boundary spanners*. Even though Clinical Analyst was new in the context of the THC post-merger integration phase, she capitalized on her 15 years of clinical experience and was able to quickly adapt to the new organizational settings. According to Nurse3, she was seen as being a "pivotal" for the rest of the team members. She had no problem to evolve like the other native boundary spanners from a *nominated* to a *boundary spanner-in-practice*. The boundary spanners took on the role of knowledge brokers by mediating the flow of knowledge across the boundaries between the members of the Clinical Working group.

Phase IB: Two activities were associated with the boundary spanners-in-practice during this phase: 1. to persuade department representatives to adopt new functionalities (ex. Physician1 pushing for the biometrics functionality) that represented more of personal agenda than a need for the user community; and 2. to "sell" the CIS solution to the various user communities - According to Clinical Analyst, the boundary spanners had to do the "dirty work" and try to persuade the department representatives to become CIS champions when going back to their professional communities. This involved exposing the advantages of the new CIS functionalities over the limited, but comfortable functionalities of the old site-based ISs.

Our data analysis suggests that there was relationship between the planned PMI approach and the nature of the knowledge boundary. The case narrative and the evidence documented in Table XXIII show that THC management adopted a *transformation* PMI approach at the outset of the project. Due to the fact that they were facing a pragmatic knowledge boundary, the agents engaged in Phase IA in a *translation* process (identification of shared meanings) that was followed by a *transformation* process (identification of common interests and transformation of the side-based site knowledge) of knowledge sharing across the boundaries. The transformation process was continued during Phase IB. To accomplish this, the agents used boundary objects during these processes that were appropriate for sharing knowledge across a pragmatic boundary. Some of these agents, as nominated boundary spanners, had no problem to evolve into boundary spanners-in-practice and engage in the negotiation of common interests. Based on the above argumentation we posit that Proposition 1 is supported for Case 3.

Proposition 2: *Agents, as boundary spanners, will try to convert their accumulated individual capital (knowledge-in-practice at the boundary) into symbolic capital to make claims about who holds relevant knowledge and create a new model of practices that, when incorporated in the new IS, reinforces those claims.*

Valuation of the Individual Capital

<u>Phase IA and IB</u>: According to the evidence presented in Table XXIV the process of valuation of others' capitals was significant during the whole period of developing and implementing the Clinical Display. A number of agents were highly regarded by the rest of the project stakeholders as being "the pillars" of the project (Clinical Analyst). However only one of them (Physician1) took advantage of his accumulated symbolic capital to claim "authoritative knowledge" to legitimize functionality in the CIS Clinical Display screens. The level of valuation of the individual capital of some of the main stakeholders remained high until the end of phase IB. Nurse3 is convinced that some of the physicians, members of the CIS Clinical Committee, were pivotal for the successful implementation of Phase I.

Table XXIV Case 3 Evidence (Proposition 2)

Concepts	Evidence
	Valuation of the individual capital of some of the agents
Valuation of Individual Capital	*Phase IA and IB*: "There are some kind of pillars, when we talk about Physician1, Physician2, and Dr. X from Paediatrics, they are people who were able to connect the system to the clinical needs they are aware of and they made sure that if there was options, then they would say, 'this is the one that we think is the best', well, they would make sure that the medical community would be comfortable with it and they would be able to testify about it because they knew their practice and, at the same time, it sticks to the vision of the system we want […] Physician1 or Physician2 would go to other colleagues and ask, 'could you participate in that' … this link of confidence spread to all the clinicians and we could then go ahead and look for other volunteers to participate in the work" (Clinical Analyst); "Physician1 - he's been in charge of the post-system that they use on six month called Ten Medical at the Downtown, so he knew what it was like to maintenance and be in charge of a system I mean he's a computer geek, I might say. He knows a lot of different things so he's very interested in that kind of stuff so he would bring some of his knowledge to the table." (Nurse1); "I think the person that was listened to the most by everyone around that table and it was a pretty big group of people, was Physician1. Yeah I think he was the most influential. If I had to choose anyone that's the person I would choose" (Nurse3); "Clinical Analyst, she was key because she was a nurse. So she was very able to bridge where we were coming from, from the clinician point of view. So that clarified a lot of things for us, you know like Clinical Analyst was pivotal as far as, you know you asked about influential people in the past, she was the liaison really between nursing clinic, clinical things and the IS yeah." (Nurse3)
Claims of authoritative knowledge	**Physician1**
	Phase IA and IB: "Myself being an THC director and having to be aware of the differences and nuances between the Downtown and Midtown and how we do things even in my division, we had to bring that to the table. [...] It might have been me or Physician2 or somebody but we said wouldn't it be great that we could see as much information in one screen as possible and then drill into a particular area when we need to because we understood the value of the columnar approach, the CIS paradigm of columns with bold and/or red bold to know whether you've got data that you haven't seen and whether it's critical and we thought that we could go one step further by providing summary with the actual data showing rather than the column because the column hides all that data. So we proposed early on to start developing almost the details we were using in the window to create that summary and at the end of our Phase 1 configuration that's what we ended up with which is the patient summary screen. And everyone thought it was such a good idea that in fact everyone uses it now across all CIS implementations." (Physician1)

Table XXV Case 3 Evidence (Proposition 3)

Concepts	Evidence
Initial functional design	**Reflects the Transformation PMI approach**
	"There was the objective, for the clinical information system, to bring back all the sites to a single tool, a means to question and to understand, to communicate, to manage the information […] an ability to gather data from different sites as well, for the same patient, centralised in one system, so that the Midtown clinic also gets the information on what is going on at the Paediatric, in Downtown, etcetera, so it is obvious that among the objectives, it's to make uniform, to standardize the information, the way to use it and the way to redirect it, to spread it throughout the entire organization" (Clinical Analyst); "We'd buy one system that would fit for everyone or everyone would use, one common system instead of having our separate systems, because trying to have all the data together would, you know, connecting it all was difficult because everybody had different systems" (Nurse1)
Final functional design	**Different from the initial design, reflects a mix of Transformation and Symbiosis PMI Approaches**
	Symbiosis – What we [physicians] wanted is a computerized system that meets the needs of everybody and because we know patients move from the Paediatric, Midtown and Downtown, it was in all of our interests to get something that we could all use. It makes life easier for us. […] We want to see the results easily and quickly. We want to be able to access their [patients] appointments and know when they're being seen. We want to access their radiology results. We want to, eventually want to know what medications they're on. We want to see their admissions and discharges and eventually all the notes should be on." (Physician3); "We spent quite a bit of time in the work groups figuring out what people wanted to see as functionalities. We had long lists of functionalities and then we had, you know, screens made based on those functionalities. We basically told people what do you want, we figured out in a list what they wanted, we went out and got a system that did, that gave them that and then we basically put in screens, the work groups put in screens for themselves what they wanted from the system." (Physician2); "Yes, I think this was active and deliberate, it wasn't accidental. So we did go through a lot of details but we also provided almost an intuitive workflow validation. Because as a clinician you would say, okay if I saw this in real life can I use it. And if someone is less computer literate can they use it with equal ease? So we had all those concepts floating around and it went into the iterations. […] The final configuration was quite different than the initial one." (Physician1)
	Transformation - "… they changed labels' names, they changed the sequence of how things were going to be, what was included for profiles and different things like that, what should be in the, you know, the summary page, and there's different stuff like that" (Nurse1)

As documented in the case narrative and in Table XXIV only one agent, having the capacity of *boundary spanners-in-practice*, tried and successfully used its accumulated symbolic capital to claim legitimate knowledge and change the model of practices that were built into the functionality of the new IS, the Clinical Display. In sum, Proposition 2 is partially supported for Case 3 (only for boundary spanners-in-practice).

Proposition 3: *The planned configuration of the IS that reflects practices related to a specific PMI approach may be different from the final configuration at the end of the ISD process.*

Planned IS Configuration

According to the evidence presented in Table XXV the initial design of the Clinical Display (Phase I CIS) was supposed to reflect the upper management's objective to implement a CIS that would enable new standards of best practice: a centralized repository with one point of entry to access and manage patient data. To achieve this, the Clinical Display was supposed to: 1) increase the quality of healthcare by providing a single point of access to patient information regardless of its physical location, thus changing clinicians' practices of patient information management; and 2) try to get a "buy-in" from the THC clinicians that would ensure the successful implementation of the last two phases of the CIS project.

Final IS Functionality

The evidence from the interviews (Table XXV), archival data and the case narrative show that the resulted functionality of the Clinical Display was different from the initial functional design. In the PMI context of the THC, as expected, the resulting functionality of the new IS was different from the initial design proposed by Delta. The difference was the result of the work of the members of both project groups: the CIS Clinical Committee and Clinical Working Group. The difference can be explained by the fact that CIS technology had a high level of configurability. On one hand, the nurses on the wards were able now to have a single point of access to the site-based pertinent clinical information. On the other hand, the Clinical Display offered the physicians the

"best of all" in terms of accessing all needed information from all the sites regardless of their physical location.

Clinical Display's final design reflected a unified approach to managing patient information across the THC sites. However, while for the site-based nurses the system brought new practices (*transformation*), for the physicians it reflected a single point of access to a blend of site-based workflows (*best of all*), a more efficient management of patient information across all sites. In conclusion, our analysis found a mix of *transformation* (for nurses) and *symbiosis* (for the physicians) for the resulted PMI approach compared to a *transformation* approach for the planned IS configuration. Therefore, Proposition 3 is supported for Case 3.

From a processual perspective, as synthesized in Table XXII, each of the three Propositions presented a temporal evolution throughout the two phases of the CIS (CD) development. As in Case 1 and Case 2, the planned PMI approach created a pragmatic knowledge boundary between the agents at the beginning of the project (Proposition 1). To create effective knowledge sharing, the agents engaged in a translation process of knowledge sharing followed by a transformation process in Phase IA that was continued in Phase IB. At the outset, management nominated agents as boundary spanners that were well appreciated within the three fields of practice. These agents rapidly evolved into boundary spanners-in-practice and successfully acted as knowledge brokers (Phase IA) and later as trade-off negotiators (Phase IB). Concerning Proposition 2, during Phase IA the agents engaged in processes of valuation of other team members' individual capital that resulted in the creation of symbolic capital that eventually was used to claim relevant knowledge by only one agent (Physician1) in Phase IA and IB. The final IS configuration was different from the planned configuration as conjectured in Proposition 3. The configuration of the system evolved during the two phases of the project reflecting the agents' understanding of others' practices and their specific requirements (physicians versus nurses).

5.5.5 Inductive Analysis

Theme 1: "Us-versus-them". The two agents from the Paediatric site (Nurse3 and Manager1) saw in the CIS project an opportunity to engage in symbolic discourses of "we" versus "them" (Adult sites). They both made a point of categorizing the Paediatric field of practice as being unique and completely different than the other two main fields at the THC.

> "I think the Paediatric were smaller. That's an advantage to us. A disadvantage on certain aspect, but on many levels it's an advantage because we get things done. The fact that we're one Paediatric hospital in an adult milieu and I think I've mentioned that before, brings with it its own challenges. So, we're even smaller in the game on the radar of all of this. So whenever somebody raises their hands to say I'm sorry at the Paediatric that doesn't work like that, it's like oh well what again. And it's unfortunate, but we don't have the same systems in a lot of cases, we don't have necessarily the same issues and same risks."(Nurse3); "The Paediatric knows exactly what they want. They always know exactly what they want, they are very proud of the system, their, the general structure. They had very good representation. They had broad representation, they had planned representation, whereas the other, the other hospitals never, you know, we had to really work hard to get people to come around the table, that was never the case with the Paediatric." (Physician2)

In addition, two others project stakeholders representing the Downtown site engaged in a process of social reconstruction of their respective field of practice by praising its superiority among the adult sites in terms of organizational structure.

> "The Midtown physically is vertically aligned and philosophically is very much army driven in terms of hierarchical structure, so it's a very vertical army hierarchy. So decision-making happens at the very top and people at the bottom really do not speak to anybody outside their silo without going upwards through the chain of responsibility and/or command. Whereas, at the Downtown physically we are spread and we're almost like a cooperative right and that's the way organizationally and personally we've been interacting." (Physician1); "The Downtown is more collegial. There is a lot of the verbal culture, not a lot written. A lot of things happen and meetings and discussion, but you have nothing written down and, and someone takes, picks up the ball and run with it." (Nurse2); "The Downtown is like a computer, it's more user-friendly. I mean it will listen to everybody, like everybody will have their opinion and everything will be taken into consideration. Even if it's a housekeeper that will come up with an idea, her idea will be taken into consideration." (Unit Coordinator)

The evidence suggests that discourses of "us-versus-them" were part of the ongoing process of justification of why each site had different needs than the other sites during ISD process. Even though officially abolished, the three main pre-merger hospitals, now THC sites, continued to exist in the minds of the agents who clearly delineated boundaries around them: people at the Paediatric site "get things done", Midtown site has an "army structure", and Downtown is like a "user-friendly computer". Despite the fact that the CIS project commenced in 2004 (seven years into the PMI phase), the

pre-merger boundaries were still present which made decisions at the THC level (upper management) to still be differently perceived and executed at the site-based department or service level.

Theme 2: Continuity of Pre-merger Organizational Identity. Each of the three pre-merger sites' identity was present in the interviewees' comments. The agents recognized that the differences between the values, norms, and structures of each site emphasize the fact that, even after all these years of post-merger integration, each site still has a clear recognizable set of values and norms will not easily be erased.

> "Because within each of the institutions, within the divisions between medicine, surgery, obstetrics, gynaecology, there's sub-cultures within the bigger culture; yes there's an Downtown and there's an Midtown culture but you've got these other little sub-cultures underneath that make up that bigger one. So you need to know what's going on within your thing." (Nurse1); "The Midtown was like 'we have the best system'. I don't know why they said that. I find we have a good system also when we work with it. It was like for ordering tests and things like that. It is true that their diet entry was much more elaborate than ours. They could enter much more information than we could." (Unit Coordinator); "The Paediatric, from the beginning of the merger they have a sense that they're different, which is true. And depending at which level of the organization you're dealing with, the sense is exacerbate or not." (Nurse2)

The evidence suggests that the agents learned to acknowledge the existence of three different field identities based on common beliefs about the value of their contextual practices, set de values, and norms from the outset of the project. They understood what is "at stake" in each field which made the ISD process to advance as planned (there were only some financial-driven delays at the end of Phase IA).

5.6 Cross-Case Analysis

In the within-case analysis we deductively analyzed the data to determine whether the findings support our three research propositions (P1, P2 and P3). We then performed an inductive analysis by revisiting the case data and found additional theoretical insights. In the cross-case analysis, the cases were compared to investigate the similarities and differences between them, first in terms of support for, or lack thereof, the propositions, second in terms of the new insights gained during the inductive analysis. The chains of evidence developed in the within-case analyses helped capture novel findings.

5.6.1 Deductive Analysis

Our analysis reveals that overall the three propositions were supported across the three cases. Table XXVI provides an overview of the results, and for each proposition, a summary of the main findings.

Table XXVI Summary results – Deductive analysis

Proposition	Case 1 (AAIS)	Case 2 (LIS)	Case 3 (CIS)	Findings
P1	Supported	Supported	Supported	In all three cases the transformation PMI approach adopted by upper management introduced a pragmatic knowledge boundary. The evidence shows that high level of knowledge complexity and different interests among agents were present at the boundary. This created demands of knowledge sharing processes of translation and transformation, effective boundary objects and influenced the actions of the boundary spanners.
P2	Partially Supported	Partially Supported	Partially Supported	In all three cases only some of the *boundary spanners-in-practice* tried and succeeded to convert their accumulated individual capital into symbolic capital to make claims of "authoritative knowledge". These claims materialized into models of practice that were eventually reflected by the final functionality of the three ISs
P3	Supported	Supported	Supported	In all three cases the initial configuration reflected practices related to a *transformation* PMI approach. In all three cases the final system configuration was different than the initial planned/proposed design. In Cases 1 and 2 the final design reflected a mix of preservation and transformation and in Case 3, a mix of symbiosis and transformation.

Proposition 1: *The planned PMI approach will shape the nature of the knowledge boundary between the fields of practice concerned by an ISD, thus creating demands on the types of knowledge sharing processes and boundary objects that the agents involved in an ISD will require for adequate knowledge sharing, as well as on the role of the boundary spanners.*

As documented in the case narrative, interviews data and archive documentation, in all three cases we found that the PMI approach adopted by the THC (*transformation*) shaped the nature of the knowledge boundary by creating a pragmatic boundary between the three fields of practice. Even though in Case 1 management did not have an adequate communication plan to explain what the goals of the new AAIS

were to the project team members and the rest of the clinics staff, the Patient Services Steering Committee Report (1997) clearly stated that the THC management was committed to introduce new standards of practice. This common set of practices would have been accomplished with a single set of ISs (THC IS Strategic Plan 1999). In Cases 2 and 3, upper management made it very clear that the LIS and CIS respectively were key technologies in helping the THC to implement "best practices".

The evidence suggests that in all three cases at the outset of the ISD there were three different fields of practice, each defined by historical and patent information management-based norms, values and practices: the Midtown site, the Downtown site and the Paediatric site. Also, in all three cases, the agents were facing a pragmatic knowledge boundary at the beginning of the project due to the adoption of a PMI transformation approach by the upper management. The pragmatic knowledge boundary involved a high level of knowledge complexity (difference, dependence and novelty). Difference in knowledge referred to the difference in amount of knowledge agents had about practices in the other fields of practices. In all three cases, the agents exhibited an inability to correctly assess the knowledge differences at the outset of the ISD. The effect of differences, however, was contingent on the degree of dependence – referred to as the extent to which two entities must pay attention to each other so as to meet their goals – among fields of practices (Carlile 2004). In all three cases, the agents struggled at the beginning to correctly identify their dependencies and understand their consequences. The novelty was described by the interviewees as being caused by two factors: 1) the fact that most of the agents never met before, thus they had to find common ways to collaborate and share knowledge; and 2) the three technologies (AAIS, LIS and CIS) were new to all the team members. The high level of novelty triggered the emergence of different interest among the team members.

However, the evidence for Proposition 1 presented a caveat: in all three cases the initial PMI approach was *transformation* therefore, we do not know what would have been the outcomes (type of knowledge boundary) if another type of PMI approach would had been chosen.

In all three cases, the agents, facing a pragmatic boundary, engaged in progressively complex knowledge sharing processes: *translation* followed by

transformation. By adopting this approach, they developed the "capability required at a pragmatic boundary" (Carlile 2004: p.562). The agents first engaged in a *translation* process in order to acquire the ability to assess the differences between their practices and the others' and then they continued with a process of transformation that enabled them to negotiate trade-offs and transform their knowledge about practices. In Case 1 and 3 a good part of Phase I (IA in Case 3) was dedicated to the process of translation, which was followed by transformation. Agents in Case 2 reserved the entire Phase I to identify shared understandings and then in Phase II they negotiated common interests. In Case 1 the process was iterative because after the *transformation* process, the agents had to go back to a *translation* process (Phase III) in order to advance the project at the Adult sites.

To help their collaborative effort of knowledge sharing across the boundary, the agents used boundary objects. The role that boundary objects play is that they create the premises for "boundary processes" (Carlile 2002). The data from the case narratives and interviews revealed that the agents found it important to identify and use effective boundary objects. For the *translation* process, they used standardized forms and methods such as email, technical documentation (ex. design blueprints, proof of concept, screen shots), and unstructured documentation (ad-hoc drawings in Case 1) to identify and learn about their differences and dependencies. During the *transformation* process, the agents used prototypes (on- or off-line mock-up databases) to facilitate the process where the individuals could negotiate and transform their knowledge. In all three cases, the prototype was the appropriate boundary object to be used during the trial-and-error problem solving approach typical for a transformation process.

In all three cases, during the translation process, the boundary spanners tried to foster a collaborative effort among the team members. Then, during the transformation process, they were actively involved in negotiations of common interests by acting as knowledge brokers (Case 1 and Case 2), salesmen (Case 1 and Case 3), or trade-off brokers and cheerleaders (Case 3). In addition to the confirmation of our initial conjectures, our data analysis went further and identified two types of boundary spanners: *nominated* and *boundary spanners-in-practice*. According to Levina and Vaast (2005), while the former type involves agents that are appointed as

boundary spanners by the management, the latter represents agents that are actively involved in knowledge brokering across the boundaries. A boundary spanner-in-practice describes either an agent that evolved from a nominated boundary spanner, or an agent that willingly and effectively engaged in knowledge brokering across the boundaries. In all three cases, the evidence showed that in order to be effective, the nominated boundary spanners had to evolve into boundary spanners-in-practice. To do this, the boundary spanners had to become (the two IS specialists in Case 1, CLab-Tech1 in Case 2 and Clinical Analyst in Case 3) or be recognized as legitimate participants (the three clinic managers in Case 1, CLab-Manager2 and the three physicians in Case 2, and the two nurses and Physician1 in Case 3) in all three fields of practice. In Case 2, two nominated boundary spanners were not able to evolve because they couldn't get the recognition of the other agents.

During the translation process, the boundary spanners-in-practice tried to foster a collaborative effort among the team members during the translation. Then, during the transformation process, they were actively involved in negotiations of common interests by acting as knowledge brokers (Case 1 and Case 2), salesmen (Case 1 and Case 3), or trade-off brokers and cheerleaders (Case 3).

Proposition 2: *Agents, as boundary spanners, will try to convert their accumulated individual capital (knowledge-in-practice at the boundary) into symbolic capital to make claims about who holds relevant knowledge and create a new model of practices that, when incorporated in the new IS, reinforces those claims.*

Evidence from the case narratives and interviews showed that only some of the *boundary spanners-in-practice* tried and successfully used their accumulated symbolic capital to make claims of relevant knowledge. These actions had as a goal to create models of practices that were incorporated in the functionality of the new ISs. For example, in Case 1, Paediatric-manager took advantage of the fact that the other team members were influenced by her intellectual capital (professional and IS experience) by allowing her to push the Paediatric site interests, that is, to have the first version of the AAIS reflecting the exiting practices at the Paediatric clinics, even though they knew that those practices were different from the ones at the Adult sites. In Case 2, CLab-Tech1 was able "to push" his own personal agenda because he was well-known by the agents in his field of practice, he knew very well the positions of all the agents within

the field and what their needs were. In the same vein, Micro-Doc2 took advantage of his existing social capital and accumulated symbolic capital to claim relevant knowledge. In Case 3, despite the fact the CIS technology was a novelty to him, Physician1 made claims of relevant knowledge on how the CIS should be configured because he knew that his intellectual capital (large medical and IS experience) was valued and uncontested by the agents from the two Adult sites.

Proposition 3: *The planned configuration of the IS that reflects practices related to a specific PMI approach may be different from the final configuration at the end of the ISD process.*

In all three cases we found that the final configuration of the three ISs was different from the initial planned/proposed system configuration. In all three cases, the initial design was supposed to reflect practices related to a transformation PMI approach. In Case 1, the first blueprint conceived by the members of the "user committee" in collaboration with Omega developers was supposed to reflect new practices based on industry standards. However, the final functionality was different in the two resulting database instances: one at the Paediatric site reflected a *preservation* of the pre-merger practices (influenced by the Paediatric-manager) and another one at the Adult sites reflected new practices (*transformation*). In Case 2, the initial design proposed by Sigma and approved by the upper management reflected industry standards (*transformation*). However, the final configuration reflected a mix of new practices (*transformation*) and old site-based labs idiosyncratic practices (*preservation*). In Case 3, Delta provided THC with a highly configurable system platform that was supposed to reflect upper management's objective to implement a system with a centralized repository and a single point of access to relevant clinical information. As in the other two cases, however, the final functionality reflected new practices (*transformation*) for the nurses and a blend of best-of-all (*symbiosis*) for the physicians.

According to the case narratives and the evidence from the interviews, the differences between the initial and the final configuration of the three ISs were due to the agents' interpretation of the others' practices during the ISD process. This interpretation was influenced by first, the complexity of the knowledge at the pragmatic

boundary that emerged at the outset in all three cases, especially the significant differences in practices in each of the three fields. The agents had a hard time to identify common grounds to advance the projects. In all three cases, the Paediatric site was seen as a "black hole" with its own idiosyncratic practices and the differences between the two Adult sites were mostly unknown on both sides of the boundary ("they didn't have a clue" – CLab-Manager 2 in Case 2; "it's been a wakeup call to discover that there are different ways of approaching the same process" – Midtown-manager in Case 1; "I remember people being surprised of the other practice" – Nurse2 in Case 3). Second, the agents were influenced by some of the boundary spanners-in-practice that used their accumulated symbolic power to claim relevant knowledge and convince the others that their models of practice should be included in the final functionality of the ISs.

5.6.2 Inductive Analysis

Theme1: "Us-versus-them". Our cross-case analysis revealed that in all three cases a number of agents engaged in discourses of "us-versus-them" by imposing themselves as authorized voices to speak in the name of their professional community within a field of practice. These discourses were deemed by the agents as being necessary as they considered themselves being involved in a struggle over the classification and representation of their field of practice. In Case 1, Paediatric-manager passionately tried to convince the other agents why the Paediatric site is so different than the rest of the THC sites and why she thought that her field of practice should remain independent. In Case 2, while no one questioned Paediatric site's uniqueness, it was the turn of the two agents representing the Midtown site and one representing Downtown site to engage in symbolic work of describing the values and beliefs of the lab service groups in their site in contrast to the values and beliefs of their historical opponents from the other Adult site. In Case 3, similar to Case 1, two agents characterized themselves as being authoritative voices of the needs of the Paediatric site. They both emphasized the superiority of their site's decision-making process over the ones applied at the other sites. Two other agents, representing the Downtown site, engaged in discourses about how much better Downtown's organizational structures than the Midtown's were. They used adjectives such as "army" and "silo" when they

described Midtown's hierarchical decision making process and "cooperative" and "user-friendly like a computer" when they illustrated the same structure at the Downtown site.

In all three cases agents' engagement in symbolic discourses of "us-versus-them" was part of an ongoing process of justification of why each site had different needs than the other sites during ISD process. Even though, officially the THC became in 1997 a single multi-site healthcare organization, the boundaries around the pre-merger hospitals continued to exist in the minds of the agents during all three ISD processes (from beginning of 1998 – outset of the AAIS project until mid-2006 – the Clinical Display implementation). Thus, the ever present competitiveness among the three main sites (Midtown, Downtown and Paediatric) and the perpetuation of the boundaries between the fields of practice made decisions at the THC organization level (upper management) to be acknowledged but differently applied at the site-based department or service level. In Case 1, during the first two phases, the facto project manager (Paediatric-manager) pushed for a configuration of the IS that would reflect pre-merger Paediatric practices regardless of the fact that the AAIS was supposed to be used by all THC clinics. In Case 2, the "kingdoms" defense brought the project to a stalemate at the end of Phase I and only the intervention of the upper management in Phase II had resuscitated a project that was doomed to failure. Having gained experience from the previous two projects, the upper management involved in the CIS project (Case 3) boundary spanners that were well-known and respected throughout the THC fields of practice who tackled right from the beginning the issue of "us-versus-them" by emphasizing common interests across the boundaries. They tried to inculcate a new "we" that would represent the THC and not anymore separate fields of practice. This is illustrated in the comments of one of the agents:

> "There was an 'us' versus 'them' thing and that's why I was trying to get the nursing group together to say that okay we're 'we', we're not an 'us', we're not a 'them', we're a 'we', you do it that way, everybody does it their own way, obviously we're all functioning but we have to come up with an THC kind of nursing group." (Nurse1)

In conclusion, the case narratives and the data from the interviews suggest that the symbolic discourses of "us-versus-them" have a relationship with the length and the outcomes of the three ISD processes. While these discourses were consistent throughout the three ISD processes their effect diminished over time. In Case 1, the "us-versus-them" engaged by Paediatric-manager influenced the outcomes of the

project (two different database instances, one for the Adult sites and one for the Paediatric that remained in a preservation PMI) and made it last almost 7 years. In Case 2 the "us-versus-them" during the entire Phase 1 pushed the project into a 2 years delay and had as outcome a mix of transformation and preservation. In Case 3 the same type of discourses was still present, however, this time the evidence suggests that only the outcome was affected (mix of transformation and symbiosis). It can be observed that the time that elapsed from the moment of the merger announcement (1997) might have affected the impact of the symbolic discourses of "us-versus-them". While the AAIS project (Case 1) was the first ISD process to commence at the outset of the post-merger phase, the CIS project (Case 3) was initiated in 2004.

Taking into consideration the above argumentation we propose a new research proposition:

Proposition 4: *Symbolic discourses of "us-versus-them" will affect the outcomes of and will lengthen the ISD project processes. Their effect will be stronger (towards a preservation of practices) for processes initiated at the beginning of the PMI phase than for processes initiated later.*

Theme 2: Continuity of Pre-merger Organizational Identity. The cross-case analysis revealed one main observation: the field of practice-specific "know-how" and "know-why" were mentioned in each of the three cases. The interviewees considered that there was a rationale for each field's different practices. In Case 1, the three site managers pointed to the existence of a "knowing" about how to maintain priorities and interests of the members in each field of practice. In Case 2, CLab-Tech1 considered that Downtown practices were based on pre-merger organizational identity-related set of skills and values. He saw the new LIS implementation as being an occasion for the members of his field to "mourn" the old ways of doing their jobs. In Case 3, several agents recognized that even after nine years since the official merger was announced, each of the three main THC sites had kept their separate identities that influenced their members' valuation of "what is at stake" in their respective fields of practice.

Overall, the interviewees' comments reflect the existence of separate contextual meanings and organizational symbols at each site. The agents from each of the three

sites of the THC, as members of the same field of practice, shared an organizational identity which was based on an agreement on what was at "stake" in each field. Also, as documented by the case narratives and the interviews transcripts, in all three cases effective knowledge sharing happened only after agents started to acknowledge and understand that each field has different "stakes" that needed to be taken into consideration during the process of negotiation of common interests. In Case 1 (Phase III), only after they understood the rules of each of the two Adult fields of practice were the boundary spanners successful in enticing the other agents to share knowledge across the boundaries. In Case 2 the evidence suggests that when the agents had no interest in the "stakes" in the other fields, the ISD project came to a standstill (Phase I). In Case 3 the agents acknowledged from the outset what was "at stake" in each field which made the ISD process to advance as planned.

In conclusion, the evidence suggests that in all three cases acknowledging what was "at stake" in the other fields was key to successful knowledge sharing across the pragmatic boundary. Based on this, we advance a new research proposition:

Proposition 5: *Acknowledging and learning the reason for each field's different practices will enable the agents to effectively share knowledge across pragmatic boundaries during ISD processes.*

Theme 3: Level of IS configurability – This theme emerged after reexamining the case narratives and the interviews transcripts. We observed that the agents in all three cases have linked the outcomes of the ISD process to how flexible (configurable) the system was to accommodate both the best practices imposed by the upper management and some of the idiosyncratic site-based practices.

> *Case 1*: "It was just you could take the system and you could just have people do with it what it was designed to do. Or you can get creative, work the system and morph it to give people more than what the system was designed to do" (IS-Specialist1); "So you know that was an interesting, very non-standard use of AAIS to provide a service that we needed at the clinic … We have to make everybody understand clearly that we can't build the system that responds to every clinic… there's only so much flexibility you can put in a system." (Midtown-manager)

> *Case 2*: "Sigma told us that the system would be built by themselves at a range of about 80%. We would have about 20% still. And when we would start to work, it appeared that it was the contrary. We had to build about 80% of the system" (CLab-Manager2); "We had to start from scratch even though they said 'well, a sodium is a

sodium', there were some of them but a lot of them had to be built from scratch." (CLab-Tech1); "We thought that there was one way of working with the system, common to all the sites. But … we find out that some people were expressing their concerns about the functionality and we found out that there were some different practices … workarounds depending on the problem." (CLab-Manager2)

Case 3: "The personalization of the system I think is a very important part of the implementation and we spent quite a bit of time in the work groups figuring out what people wanted to see as functionalities. We had long lists of functionalities and then we had, you know, screens made based on those functionalities. We basically told people what do you want, we figured out in a list what they wanted, we went out and got a system that did, that gave them that and then we basically put in screens, the work groups put in screens for themselves what they wanted from the system." (Physician2)

As we mentioned in Chapter 4, the three systems acquired by the THC were based on configurable technologies. Configurable IT refers to technologies that are built on a specific operating system platform from a set of software components to meet the specific requirements of a particular organization (Fleck 1994). These ITs are developed based on the belief that a collection of functionalities can be extrapolated from general to particular settings (Williams 1997). In this sense, configurable software is often seen as providing "universal or global solutions" and embedding "best practices" (Williams 1997). Software packages like AAIS, LIS or CIS were good illustrations of configurable ITs because they provided a number of discrete features that could be combined in multiple ways during the ISD process. Thus, the main goal of the agents the three ISDs was to identify an ideal configuration based on global "best practices" that would also take into consideration local contingencies (for ex. multiple site-based patient identification numbers in Case 2, different types of patient information privacy in Case 1, or different points of access to patient information for nurses and physicians in Case 3).

As documented in the case narratives and interviews, global (best practices) – local negotiations were carried out by the boundary spanners-in-practice and the agents used effective boundary objects to be able to engage in knowledge sharing practices. Throughout the transformation knowledge sharing processes, agents negotiated common interests by trying to adapt "global" principles and multiple choices to "local" requirements when possible. Such negotiations shaped different final configurations for each of the ISs. In Case 1, the AAIS ended up by having two database instances, one for the Paediatric site and another one for the Adult sites. The LIS in Case 2 had to be rebuilt from scratch after Phase 1 to enable workable "best

practices" that were different than the industry standards proposed by the manufacturer in the initial configuration. In Case 3, the agents were able to work out a configuration that introduced a balance between a common set of best practices for the nurses and "best-of-all" practices for the physicians.

The evidence suggests that each of the three acquired software packages had different levels of configurability. In Case 1, THC was Omega's first client and the clinical staff from Paediatric site performed the needs analysis. In Phase I and II, the system was configured to reflect Paediatric's practices and was unusable for the Adult sites. The fact that the system had a low level of configurability was reflected by the fact that in Phase III the agent had start the configuration from scratch with the result being two different instances of the same system. In Case 2, LIS was supposed to be 80% best practices-ready. However, the agents had to wait for a complete new version of the technological platform (Phase II) in order to be able to implement common practices. Still, the users had to improvise "workarounds" in the final configuration to accommodate the system to some idiosyncratic lab practices. In Case 3, as opposed to the AAIS and LIS, CIS was extremely adaptable to the different needs (different screens for every service or department) and at the end it was able to provide a single point of access to pertinent side-based patient information for the nurses and a single point of access to patient information for THC physicians that were working shifts in all THC sites.

Based on this argumentation, we propose another research proposition:

Proposition 6: *When configurable technologies are purchased, the level of configurability of the acquired software package will affect the final IS functionality, thus creating different ratios of global "best practices" and local idiosyncratic practices.*

> **Proposition 6a:** *When using a software package with a high level of configurability, an ISD process can produce an IS with a functionality accommodating both global "best practices" and local contingencies.*
>
> **Proposition 6b:** *When using a software package with a low level of configurability, an ISD process will produce an IS that will either reflect global "best practices" or local contingencies.*

Table XXVII – A Practice-based Theory of Knowledge-Sharing in Post-merger ISD Settings

P1 (*Organization level*): The planned PMI approach will shape the nature of the knowledge boundary between the fields of practice concerned by an ISD, thus creating demands on the types of knowledge sharing processes and boundary objects that the agents involved in an ISD will require for adequate knowledge sharing, as well as on the role of the boundary spanners.
P2 (*ISD level*): Agents, as boundary spanners, will try to convert their accumulated individual capital (knowledge-in-practice at the boundary) into symbolic capital to make claims about who holds relevant knowledge and create a new model of practices that, when incorporated in the new IS, reinforces those claims.
P3 (*ISD level*): The planned configuration of the IS that reflects practices related to a transformation PMI approach will be different from the final configuration at the end of the ISD process.
P4 (*ISD level*): Symbolic discourses of "us-versus-them" will affect the outcomes of and will lengthen the ISD project processes. Their effect will be stronger (towards a preservation of practices) for processes initiated at the beginning of the PMI phase than for processes initiated later.
P5 (*ISD level*): Acknowledging and learning the reason for each field's different practices will enable the agents to effectively share knowledge across pragmatic boundaries during ISD processes.

P6 (*Organizational level*): When configurable ISs are purchased, the level of configurability of the acquired software package will affect the final IS functionality, thus creating different ratios of global "best practices" and local idiosyncratic practices.
 	
     P6a: When using a software package with a high level of configurability, an ISD process can produce an IS with a functionality accommodating both global "best practices" and local contingencies.
 	
     P6b: When using a software package with a low level of configurability, an ISD process will produce an IS with a functionality that will either reflect global "best practices" or local contingencies.

In conclusion, our within- and cross-case analyses lead us to offer a theory that furthers our understanding of the dynamics of knowledge sharing in PMI settings by supporting the three initial propositions (P1, P2, P3) and enabling us to inductively propose three more (P4, P5, P6) based on three emerging themes. Table XXVII presents the six propositions that synthesize our theory.

In the next chapter, we discuss the six propositions that constitute our theory and provide an assessment of the multilevel and processual nature of the theory.

CHAPTER 6: Discussion

During the PMI phase, knowledge sharing across boundaries becomes more important as the organization seeks to interweave elements of the merging parties if it adopts a transformation, symbiosis or absorption PMI approaches. Interactions at the boundary bring to the fore the interdependence of practices used prior to the merger. Cross-boundary exchanges emerge as new information systems that are developed to facilitate the integration process, bring into overlap occupations unaccustomed to working together, as when a new Lab IS (Case 2 in this study) enabled common new practices to groups of lab professionals that were competitors until the THC merger occurred. Challenges for knowledge sharing across boundaries in a PMI context arise from sources of distinction separating the merging parties: differences in practices, knowledge bases, ISs, assumptions, values, or organizational symbols.

This dissertation proposed a conceptual framework that allowed us to advance three research propositions that tried to answer the two main research questions and constituted the underlying foundation of a process theory on knowledge sharing in post-merger ISD settings that we developed based on the data analyses of three cases.

In section 6.1 we will discuss the six propositions that constitute our theory. Section 6.2 proposes an alternative theoretical lens for examining the post-merger boundary management dilemma. Section 6.3 provides a discussion on the multilevel and processual nature of the theory.

6.1 A Practice-based Theory of Knowledge-Sharing in post-merger ISD settings

The main focus of our study was on the analysis of the dynamics of knowledge sharing at the boundary during three ISD projects by adopting a practice perspective. We developed our conceptual framework based on three key premises.

- Boundaries among fields of practice are differentiated by the level of complexity of knowledge at the boundary.

- Distinctions among agents' amounts of capital convey their relative position in a field of practice and influence their ability and inclination to share knowledge across the field's boundaries

- Information systems do not have pre-defined structures of their own and can only be defined in relation to the practices of prospective users, or to the business processes and institutionalized values of the organization implementing the technology.

To assess the boundaries among the fields of practices, we adopted Carlile's (2004) framework based on three relational properties of knowledge at a boundary: difference, dependence, and novelty. This provided us with a means to describe the dynamics between the agents collaborating during ISD as circumstances at the boundary were growing more complex. The concepts of field of practice and individual status (Bourdieu 1977; Bourdieu and Wacquant 1992) gave us a lens to analyze the differences between the spaces in which agents share practices and the differences between their relative individual statuses. Finally, having in mind that ISs are characterized by a "lack in completeness of being" (Knorr-Cetina 2001) during their development, we assessed the evolution of the design of the three systems during the processes of knowledge sharing. The theory based on 6 propositions and synthesized in Table XXVI helped us to recognize that there is a dilemma of integration versus autonomy (Haspeslagh and Jemison 1991; Ellis 2004) when dealing with ISD in a PMI context.

Proposition1. We conjectured in our conceptual framework (Chapter 3, Table IV) that the degree of dependence among the fields of practice is influenced by the degree of strategic interdependence that a PMI approach calls for. THC management realized that, due to the strategic need for interdependence and the need to tolerate multiculturalism between the sites, the most appropriate PMI approach in this context would be a transformation approach (cf. Haspeslagh and Jemison 1991).

All three ISD projects assessed in our study represented initiatives that reflected the planned transformation PMI approach. Our data analysis suggests that in all three cases the transformation approach created a pragmatic knowledge boundary between the agents from the three main fields of practice. To cope with a pragmatic boundary,

the agents decided to start with a translation process to identify common understandings about their practices and continue with a transformation process that gave them the ability to negotiate trade-offs and change their knowledge about practices. The evidence shows that by adopting this approach, the agents acquired the necessary capability to assess and share knowledge across a pragmatic boundary (Carlile 2004).

According to Carlile (2004), knowledge with a high degree of complexity is found at a pragmatic boundary and a successful process of sharing knowledge across a pragmatic boundary requires the capability to engage in progressively complex and sometimes iterative processes of knowledge sharing. This capability is illustrated by four characteristics. First, the agents develop a common lexicon to assess each other's knowledge. Agents at the THC, while being members of different site-based fields of practice, were using a base common language when they were managing patient information, as they had to follow standards and guidelines of the provincial health ministry.

The second characteristic required is that the agents need "the ability to identify and learn about differences and dependencies" (Carlile 2004: p.562). In Case 1, Midtown-manager was surprised to find, at the outset of the project that the same type of patient information would be managed in so many different ways. The evidence suggests that the agents in the three ISD processes used boundary objects appropriate for a translation process such as structured and unstructured technical documentation and email technologies. Regular, formal meetings were the preferred way for agents to share knowledge.

Third, the agents need to transform their domain-specific knowledge in order to effectively collaborate. They must be able "to propose, negotiate, and transform knowledge" (Carlile 2004: p.563). The boundary spanners in our three cases engaged in processes of trade-offs negotiation to mitigate as much as possible the effects of the "best practices" brought in by the new IS on the field-based practices. By using effective boundary objects such as mock-screens and prototypes, the agents were able to represent their various concerns and engaged in negotiations and transformation of their knowledge. For example, in Phase II of Case 2, the agents found having access to

the online LIS prototype and being able to create real life scenarios with fake data helpful.

Fourth, an efficient knowledge sharing process at a pragmatic boundary sometimes requires multiple iterations. "Addressing the consequences cannot be resolved with one try" (Carlile 2004: p.563). Agents might need to go back and forth between translation and transformation processes in an iterative way that enables them "to get better at identifying what differences and dependencies are of consequence at the boundary; they improve at collectively developing a more adequate common lexicon, meaning, and interests" (Carlile 2004: p.563). The evidence shows that only in Case 1 the agents needed to go back to a translation process (Phase III) after the transformation process (Phase I and II). They had to re-assess the differences and dependencies of consequences as the structure of the team and the context of the ISD changed after Phase II when the AAIS was implemented at the Paediatric site.

The conceptual and prescriptive value of Proposition 1 is two-folded:

1. Understanding the different facets of common knowledge (common lexicon, meanings, and interests) at the boundary and the ability of the agents involved in ISD processes to use them improves our understanding of what an effective boundary object is. The distinction between types of knowledge sharing processes at a pragmatic boundary reminds us that depending on the type of knowledge process adopted, boundary objects with different characteristics are required.

2. Only boundary spanners-in-practice were able to successfully act as knowledge brokers and mediate the knowledge sharing across a PMI pragmatic boundary. The evidence suggests that in highly novel ISD contexts, only agents that were perceived as legitimate participants in the involved fields of practice were capable to span boundaries and negotiate common interests.

Proposition 2. Agents in cross-boundary practices are expected to bring expertise specific to their role to the endeavour at hand. In a new product development effort, participants bring distinctive expertise to shape the feature, performance, and production processes for the new product (Henderson 1991). Their distinction is accentuated even more by the fact that agents on each side of the boundary have

accumulated different kinds of capital (Bourdieu and Wacquant 1992). However, various forms of individual capital only matter to the extent that other people in the situation value them (Bourdieu 1989).

The evidence shows that agents involved in the three ISD processes were representatives of different sites and at the outset possessed significant amounts of social and intellectual capital accumulated in time within their fields of practice. Even though most of the agents from different sites never met before, they were aware of the other agents' hierarchical position and had heard of their professional reputation within their respective fields of practice. However, during the knowledge sharing processes only some of the boundary spanners-in-practice tried and successfully converted their accumulated capitals into symbolic power to claim "authoritative knowledge" (Suchman 2001). They created models of practices that were incorporated into the system's functionality.

Proposition 2 confirms Suchman's (2002) argument that, assumptions about who holds authoritative knowledge often supersede the known reality and create models of practices that if incorporated in the new IS, reinforce those assumptions. It also supports, albeit in a specific organizational context, Bourdieu's (1989) statement that for agents to acquire symbolic capital, they need to experience a process of valuation. Any agent's capital would matter to the extent that others in the situation (ex. team members) value those forms of capital, changing them into a source of symbolic power.

Proposition 3. Data analysis suggests that the resulted IS functionality was different from the initial functional design and it didn't reflect the practices promoted by the transformation integration approach adopted by management in all three cases. Rather, the final functionality reflected the agents' understandings of the others' "knowing" as they were influenced by the knowledge complexity at the boundary and the actions of the boundary spanners. People draw differently on experience to transform and create different organizational patterns (Orlikowski 2002).

Information systems under development have the capacity to continuously unfold, as they are not static, fixed, or given (Knorr-Cetina 2001). Thus, through the process of knowledge sharing, the three ISs were continuously defined, and they

changed their properties (e.g. the several versions and "patched-up" new releases of the AAIS and LIS in Cases 1 and 2). These ISs' have had some material instantiations (e.g. specific software versions), but their functionality continuously evolved during their development process. In each of the cases, their final functionality reflected a trade-off between the integration approach that management adopted and the local contingencies.

In Case 1, the AAIS finished by having two different instances of the same database, one for the Paediatric site and another for the Adult sites. This meant that management recognized that, in fact, the Paediatric ambulatory clinics couldn't be integrated with the rest of the THC clinics. In Case 2, management decided to provide technical assistance to a non-canonical use of the LIS when it found out that staff from some of the labs were performing "workarounds" to engage in idiosyncratic practices. In Case 3, the management approach was to create the conditions for an early "buy-in" of the CIS. Physician2, as one of the two co-sponsors of the project, emphasized during the interview how important it was for all stakeholders to be happy with the Clinical Display in order for THC management to have the support of the users during Phase 2, which was supposed to bring a total change in clinical practices across all the sites.

All these examples confirmed that THC management realized that the initial PMI approach didn't reflect the reality in the three fields of practice in each of cases. The Integration Design on PMI suggests that while value creation results from an organization's ability to integrate practices across the previous organizational boundaries (Larsson and Finkelstein 1999; Pablo 1994), too much integration may render some of the knowledge (knowing) embedded in those practice useless due to its contextual nature (Ranft and Lord 2002). Thus, according to our interpretation of the data, the THC management adopted an overall "ideal" integration approach for the new organization, but braced itself for a lengthy process of negotiation and trade-offs with the stakeholders of each project and in time realized that a hybrid integration approach (cf. Schweizer 2005) might be the appropriate path to take.

Proposition 4. As documented in the cases narratives and in the interviews data, some agents engaged in discourses of "us-versus-them" that slowed down the progress

of the processes of IS development and affected the final IS configuration. The symbolic discourses of "us-versus-them" are described by Bourdieu (1987) as practices of "group-making".

The social reality, according to Bourdieu (1987), can be objectively divided into different social spaces, the occupants of which are said to be sharing objective similarities and thus constitute groups or classes. But, Bourdieu argues, no real group exists without some agent naming the group and therefore bringing it into existence. Classes exist "only inasmuch as […] historical agents […] have succeeded in transforming what could have remained an 'analytical construct' into a 'folk category' […] produced and reproduced by the magic of social belief" (1987: p.9). Thus, groups exist only as a function of symbolic work and are reified by practices of "group-making" of specific agents (Bourdieu 1987: p.10). The process of group-making is described by Bourdieu (1987) as having "logic of existence by delegation" or "by proxy". The author considers that a "class" exists when there are agents capable of imposing themselves, are authorized to speak and to act officially in its name and who are recognized by the other members of the group as being endowed with full power to speak and act in their name. Therefore, the production and reproduction of groups and classes are characterized as being processes of social construction in which specific agents' symbolic practice of "group-making" is seen as necessary during agents' participation in struggles over the classification and representation of communities.

Group-making actions in each of the three cases, confirmed Bourdieu's (1987) assertion that groups (in each of the three cases each field of practice was considered as a "group") don't really exist unless some agent acts as a group "proxy" by producing and reproducing the structures of that group in symbolic discourses. Case narratives and evidence from the interviews suggest that practices of symbolic "group-making" threatened to trigger "power dynamics that undermine collaboration" (Levina and Vaast 2008). In Case 1, Paediatric-manager mixed symbolic "group-making" and claims of relevant knowledge that skewed the existing power dynamics within the project team and helped her reproduce the Paediatric old practices into the IS configuration. In Case 2, the symbolic discourses of "group-making" hindered the process of knowledge sharing and had, as a result a power struggle (defense of the "kingdoms") that ended in a project stalemate at the end of Phase I. Even though the management

intervention and the brokerage actions of the boundary spanners-in-practice unlocked the situation in Phase II, the final configuration still reflected the effects of the "group-making" discourses: the LIS had to be adapted to the fact that Paediatric site had specific order entry methods and the some of the lab staff introduces "workarounds" in the system to accommodate practices based on site-based norms. In Case 3, the symbolic "group-making" discourse continued, but their effect was minimal. The evidence shows that after 11 years of PMI, the agents seemed to be used to this type of discourse as being part of a multi-cultural, multi-boundary post-merger organization.

Proposition 4 suggests also that Bourdieu's (1987) assertion that the power to reproduce groups through symbolic "group-making" stems from accumulated individual symbolic capital was validated only in Case 1 (Paediatric-manager). In the other two cases, the evidence shows that the agents felt compelled to engage in symbolic discourses about their field of practice by virtue of being member of that group and not necessarily by claiming to be an authorized voice to speak in the field's name.

Proposition 5. We adopted Hatch and Schultz's (1997) definition of organizational culture as representing the symbolic context within which interpretations of organizational identity are formed. In this perspective, organizational identity is seen as being "grounded in contextual meanings, organizational symbols and thus embedded in organizational culture" (p.358). Ravasi and Schultz (2006) argue that there is a clear relationship between organizational identity and work practices. Thus, Dutton and Dukerich (1991) assert that organizational identity provides a set of skills and a way of using those skills that generates specific work practices. The concept of organizational identity is replaced in the literature on practice perspective by the concepts of "objective complicity" (Bourdieu 1993) or "sameness" (Moingeon and Romanantsoa 1997) which can be described as a set of common beliefs about the practices, values and norms within a specific field of practice. Orlikowski (2002) and Moingeon and Romanantsoa (1997) link the concept of organizational identity to the existence of shared practices engaged in by the members of a field of practice.

Adopting a practice perspective, Orlikowski (2002) found in her study of Kappa, a multinational organization, that while engaging in practices to develop a product, the employees used their organizational identity to generate a "knowing" about the

organization and about how to maintain priorities and interests of the rest of the organization's members. In this case, Kappa's employees, as members of the same field of practice, created among themselves a so called "objective complicity" (Bourdieu 1993: p.93) which is based on common beliefs about the value of what is at stake, or what is worth struggling for in their field of practice. Thus, the "objective complicity" points to the existence of a shared set of values, norms, and practices, which are constitutive elements of the field "sameness". According to Moingeon and Romanantsoa (1997), the "sameness" in a field of practice can be compared to the organizational identity, which is at the same time the glue that holds the structures of the field together, and the trigger of the struggles for the stakes in the field.

During the process of interviewing, the interviewees mentioned that the THC hospitals had different organizational cultures and identities. CLab-Tech1 (Case 2) even revealed the existence of an "identity crisis" that was triggered by upper management's decision to implement a unique across-site lab IS. In Case 1, the two managers from the Adult sites acknowledged that the Paediatric site's practices were different (Midtown-Manager: "the Paediatric site is a black box") but they didn't try to understand why they are different. The result was that Paediatric-manager was not really enticed to make the others understand why Paediatric clinics' needs were different from the Adult clinics' and the end of Phases II the AAIS was not configured for shared practices. In Case 2 during Phase I, due the struggle over which site's "knowing" was better than the others', the agents showed little interest in acknowledging what was "at stake" in the other fields. Thus, the ISD project reached a standstill at the end of the phase. However, in Case 3 the agents understood why each of the three fields had a different "sameness" or "objective complicity". The result was that agents successfully shared knowledge from the outset and the ISD process advanced as planned.

Proposition 5 suggests that Carlile's (2002) assertion that the context surrounding the boundary is "accessible" to an agent as long as he or she can competently assess it in communicating with other agents by using shared *boundary objects* to represent the knowledge on both sides of a boundary is not enough in PMI settings. The evidence in our three cases pinpoints to the fact that in addition to effective boundary objects, agents needed to acknowledge and learn the rationale for

each field's different practices in order to be able to effectively share knowledge across pragmatic boundaries during ISD processes.

Proposition 6. In this proposition we asserted that in a transformation PMI approach context the final configuration of a new IS reflects a mix of global principles (ex. industry best practices) and local principles (site-based idiosyncrasies in all three cases under study) (Fleck 1994; Pozzebon and Pinsonneault 2005) and the ratio of this blend will be affected by the level of configurability of the IS under development.

According to Pozzebon and Pinsonneault (2005), when local-global sharing is not present, the IS developers make "blind configurational decisions", that is, they will have an over-confidence in global principles and a disregard of the local context, or the other way around, both resulting in poor system configurations. An ideal blend of local and global requirements is attained through a process called "crystallizing contingencies" (Fleck 1993) in which local contingencies and idiosyncratic needs are gradually embedded into a particular configuration.

The evidence suggests that in Case 1, due to the fact that the THC was manufacturer's first client, the AAIS' initial configuration was conceived with the Paediatric site's needs in mind. Also, the technology didn't have a high level of configurability because in Phase III, the agents had to build a complete different database instance for the Adult sites. Thus, as illustrated in Figure 6, we consider that the AAIS presented a configuration based on "blind configuration decisions" and on a rather inflexible technology. The global-local ratio was leaning toward the local contingencies. In Case 2, the LIS' initial software package didn't include workable best practices and didn't either accommodate local contingences. The agents had to re-build the system on a different platform (Phase II) in order to implement THC's approach of best practices. The technology didn't have a high level of configurability as a number of local contingencies had to be accommodated through improvised "workarounds". The CIS in Case 3 presented from the outset a high level of configurability. The first system module (Clinical Display) was capable to accommodate most of the clinical (nurses and physicians) requests by providing comprehensive screens with single points of access to pertinent patient information.

Proposition 6 suggests that the higher the level of configurability an IT has, the better the chances are that an ISD will produce an IS with a functionality that will reflect a balance between the strategic need for interdependence and the need to tolerate multiculturalism between the sites required by an ideal transformation PMI approach (cf. Haspeslagh and Jemison 1991).

Figure 6 Ratio of Global (Best practices) and Local Contingencies
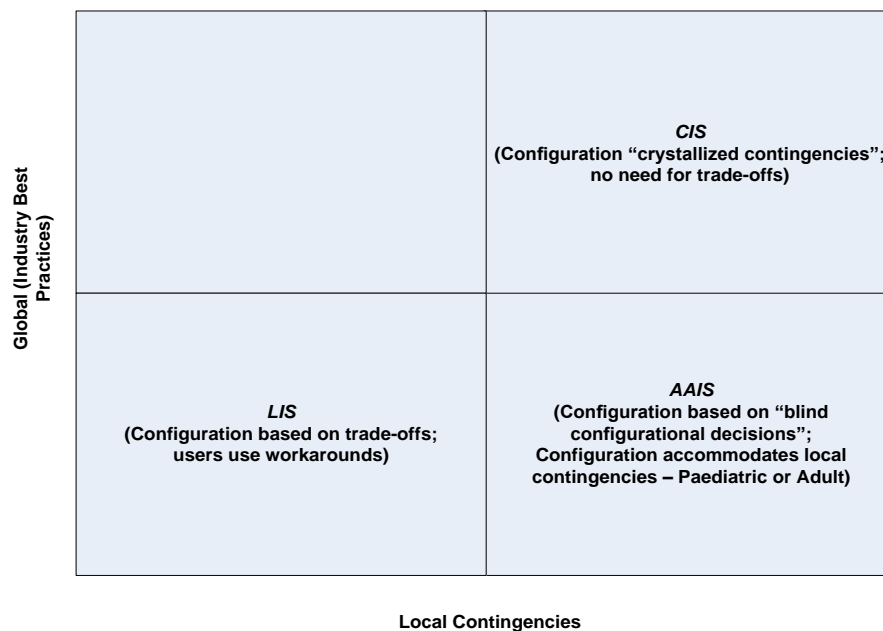
In conclusion, acknowledging the importance of matching the common knowledge (lexicon, meaning, interests) with the type of boundary faced (Carlile 2004), as well as recognizing that in a PMI context agents tend to reuse pre-merger accumulated knowledge (Ranft and Lord 2002), we were able to propose a prescriptive framework based on Ellis' (2004) typology of ideal PMI approaches. According to this typology (Figure 2, Chapter 2), depending on their interdependence and organizational autonomy needs, organizations that engage in mergers adopt an integration approach from one of the four quadrants. Our data analysis revealed that THC's post-merger structure could be characterized as being a collection of departmental "micro-mergers"

(Denis et al. 1999), therefore it doesn't fit any of the four ideal approaches advanced by Ellis' (2004) matrix. While the planned PMI approach was a transformation, the outcomes of the three projects suggest a hybrid integration approach: the resulting PMI approach was a mix of preservation and transformation for Cases 1 and 2 and a mix of symbiosis and transformation for Case 3.

In a PMI context, on one hand, merging organizations need to overcome idiosyncrasies in terms of "knowing" embedded in practices if they want to share knowledge-based resources (Leroy and Romanantsoa 1997; Villinger 1996). On the other hand, modern organizations choose a mix of integration approaches including preservation based on the type of shared resources or capabilities (Yoo et al. 2007; Graebner 2004). The THC management chose the monolithic way by adopting one type of integration approach without thinking much of the effects of the differences in pre-merger organizational identities and practices between the three main sites and the historical rivalry between the Midtown and Downtown sites.

One of the motives we engaged in this research was that literature on PMI is silent on the dilemma of integration versus autonomy when dealing with the information systems of the merging parties. While adopting the practice lens, we realized that this is but one perspective to examine this complex and dramatic organizational change. Following, we propose an alternative view that might constitute a future topic of study.

6.2 Organizational Learning perspective – An alternative lens

The PMI literature has focused on the important role the choice of integration approach and post-merger process itself can play. Extant work from this perspective is looking into using the organizational learning lens to enhance our knowledge of how organizations can learn from their prior merger experiences. Organizational learning (OL) appears to be mixed in the merger context (Haleblian and Finkelstein 1999) with the nature, variety and performance of prior experiences playing an important role (Hayward 2002). We consider that OL perspective could also be applied in the particular case of the THC's merger, but to examine a different learning aspect. We could use it to identify if there was a learning phenomenon among the THC's members, including the management, from the outset of the first project (AAIS) which was

initiated right after the merger announcement in 1997 until the outcome of the third project (Clinical Display – CIS) in spring of 2006, almost 9 years after.

The case narratives and the evidence from the interviews suggest that while in Case 1 and 2 the difference between the planned PMI approach and the resulted approach (mix of transformation and preservation) was significant (especially in Case 1), in Case 3 the resulted approach was a mix of two approaches (transformation and synergy) from the same quadrant (Q2) of Ellis' (2004) typology of ideal types. We remember that merging organizations situated in Q2 have a need for strategic interdependence and a need to tolerate multiculturalism. Thus, the difference between the planned and resulted PMI approach in Case 3 was still there but not that significant than in Case 1. Therefore, did the organization learn from the experience gained in each of the three ISD processes over time? If so, how did the process of organizational learning unfold?

Argyris (1977) defines organizational learning as the process of detection and correction of errors. In his view organizations learn through individuals acting as agents for them: "The individuals' learning activities, in turn, are facilitated or inhibited by an ecological system of factors that may be called an organizational learning system" (p. 117). Research in OL is driven by a desire to understand how the process of learning occurs within organizational settings, both at the individual, group and organizational level. Researchers interested in OL have different viewpoints depending on their epistemological and ontological stances. The closest to our stance is the socio-cultural perspective on OL. From this perspective, the creation of a learning culture takes into consideration elements of the existing culture (or pre-merger cultures in the case of THC), the socialization process, and the individual sensemaking (Weick 1995) that drives organization members' understanding of organizational rules. According to Brown and Duguid (1991) and Weick (1995), organizational learning is conceptualized as a series of interrelated actions of individuals towards creation of a collective mind, where shared meaning drives the learning process.

Learning in this perspective is only validated by the meaning given by the individuals, which occurred at the THC through the processes of knowledge sharing during the three ISD projects, or through symbolic exchange of cultural artifacts, such as stories and rituals that were made public through discourses of "group making".

While making it clear that each of the three sites was different, the agents acknowledged over time the others' values and learned to respect everyone's viewpoint. In time, everybody figured out the difference between "the way things are done" (separate fields of practice) versus "the way they are supposed to be done" (a main set of common practices mixed with a number of unavoidable idiosyncratic site-based practices).

From an Organizational Learning perspective, we can argue that the management learned over time that THC is better off as a loose confederation of site-based cultures with common ISs that span boundaries and enable main common best practices and accommodate, if possible, a number of site-based practices.

6.3 A Multilevel Process Theory

It has been argued that IT-driven organizational change is a social process (Orlikowski 1996), and that a theory of change is best framed as a process theory rather than as a variance theory (Mohr 1982). In the case of a radical change such as a merger, process models can handle more complex causal relationships than variance models can and provide a better explanation of how the inputs and outputs are related at different levels of analysis, rather than simply identifying the relationship like the variance models do. Organizations must be considered as being multilevel phenomena (Tsoukas and Chia 2002) and theories of change should take into consideration how "processes at different levels affect each other" (Poole and Van de Ven 2004).

Important change processes in organizations, such as PMI, can be explained alternatively or complementarily over time by four different theories of change or "motors": life cycle, teleology, dialectic and evolutionary (Van de Ven and Poole 1995; Poole and Van de Ven 2004). The multilevel process theory developed in this dissertation employs a dual-motor perspective. It provides an explanation of how organizational-level decision events, such as the choice of a PMI approach, impact on how the functionality of new ISs will be designed and developed at a group level, and how those organizational-level events, in turn, are shaped by the group-level events and effects.

We considered the processes of the three post-merger ISDs at the THC from a dual-motor perspective: *teleological* and *dialectical*. The process as a general case is

presented in Figure 7. We assumed that change was driven by the actions of agents, usually managers, who tried to create a new organizational form. These individuals are usually assumed to be as rational as they are perceived in the traditional teleological models of change. These rational agents plan the implementation stages in order for organizational strategic goals to be met.

As we mentioned earlier, we assume that organizations are complex entities that usually are comprised of goal-driven individuals whose personal agendas might be incompatible with the organization's, such as the physicians and nurses in Lapointe and Rivard's (2005) description of users' resistance to a new medical IS. As opposing individuals interact in an effort to impose their respective goals, organizations may change in response to resolutions of conflicting interests. For example, Lapointe and Rivard (2005) describe how, in one hospital, the outcome of the conflict was the dismissal of the CEO and a major downsizing in functionality of the system, whereas at another hospital the user community successfully adopted the system.

Thus, it can be inferred that the mechanism for driving change is dialectical because it sees change as being the product of the interplay between opposing forces. A dialectic motor at the organizational level of analysis describes how the divergent goals of individuals produce organizational change. At the same time, because the dialectical process encapsulates teleological forces in opposition, the two motors are coexistent in an interdependent relationship.

Given the relative complexity of a dual-motor theory, we assumed that practices resulting from the planned PMI integration approach may vary considerably. That is, there was reason to expect new practices to not resemble to the ones envisioned by the management at the outset of AAIS, LIS or CD (CIS) projects. In this view, emergent outcomes are products of indeterminate interplay among opposing forces and are difficult to predict a priori (Pfeffer 1982).

One of the purposes of our theory was to identify the actions and interactions operating to produce change at the ISD and organizational levels. It is important to remember that the THC was the result of a merger of equals. Therefore, the THC strategic documentation regarding the decisional process of the PMI approach shows that at the organizational level, rational agents (managers representing the formerly

independent hospitals), driven by the same goal, to integrate the five sites, agreed on a common integration approach.

Figure 7 Post-merger ISD Process – General Model
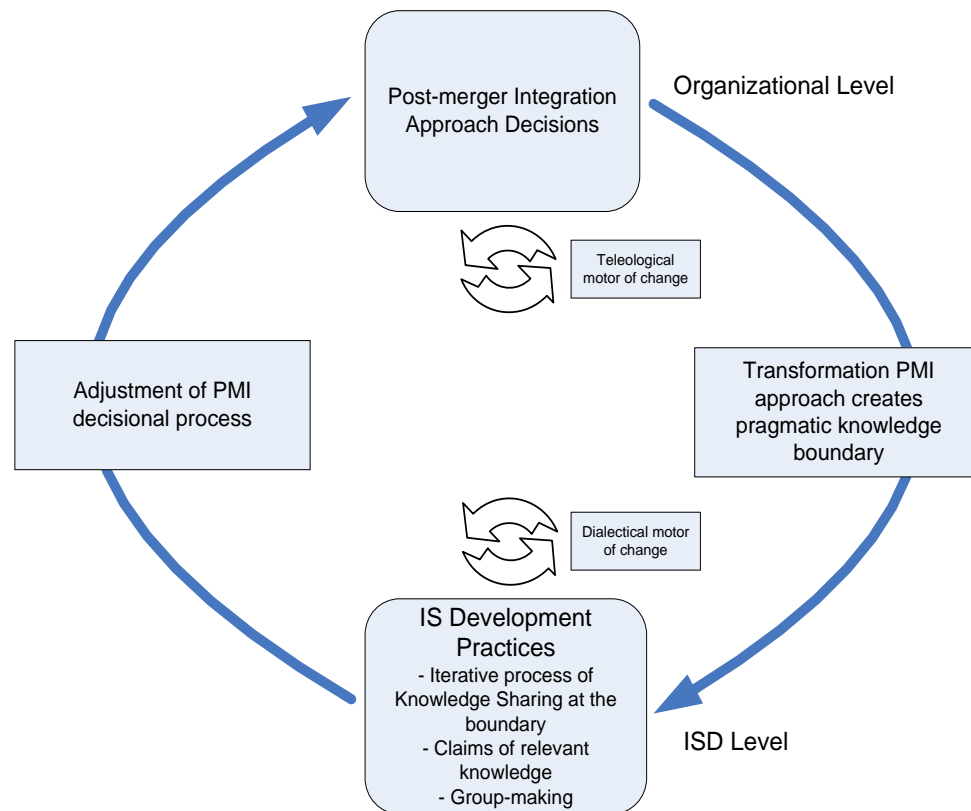
The transformation PMI approach has as a goal the implementation of new practices while the old ones are abandoned. As discussed earlier, the planned PMI approach at the THC influenced the nature of the knowledge boundary and the actions of rational agents involved in knowledge sharing practices during the three ISD projects. At the ISD level, some of these agents engaged in symbolic practices of "group-making" to try to promote field-based interests. Some of these fields overemphasized loyalty and conformity (Paediatric site), while the others (Downtown and Midtown) were always in fierce competition against each other. In dialectical models of change, conflicts emerge between entities pursuing a thesis and antithesis that collide to produce a synthesis. In the three cases, contradictions and struggles

between the three main fields of practice, enacted by agents that were representing these fields in the project teams, triggered changes/adaptations in the PMI decisional process at the organizational level.

Figure 7 illustrates the operation of both teleological and dialectic motors across the process of knowledge sharing at the boundary during a post-merger ISD. At the outset of the ISD, a teleological motor operates at the upper management (organizational) level to implement ISs that would reflect practices of a transformation PMI approach. However, the defined goal is countered by opposing forces in the form of agents representing the three main fields of practice that either try to consolidate the existing boundaries or engage in negotiations of common interests (ISD level). The resulting dialectic leads to a lengthy iterative process of knowledge sharing at the boundary and to a change/adaptation in the decisional process regarding the PMI approach.

In Case 1, the management of the new merger organization decided to acquire the first enterprise IS, the AAIS (Phase I - *teleological motor*). The decision to implement new best practices created a pragmatic knowledge boundary between the project team members. Due to claims of relevant knowledge and practices of "group making" (Paediatric-manager), the process of knowledge sharing during Phase I can be described as a struggle for boundary conservation around the Paediatric site (*dialectics motor*). At the end of Phase I and beginning of Phase II, management accepted to install the system only at the Paediatric site (*decisional adjustment*). At the beginning of Phase III, management decided that the system needs to be installed at the Adult sites to enable common best practices (*teleological motor*). The agents engaged in translation and transformation knowledge sharing processes and negotiation of common interests (*dialectics motor*). The outcome of the ISD process was that management accepted to have a system with two different database instances and two sets of practices (*decisional adjustment* – mix of transformation and preservation PMI approaches).

In Case 2, management decided to acquire a new LIS that would enable a unique set of best practices for all labs across the THC (*teleological motor*). Phase I is characterized by the agents' struggle to defend their "kingdoms" (*dialectics motor*). At the end of Phase I, management decided to stop the project and re-assess the

situation (*decisional adjustment*). At the outset of Phase II, THC acquired a new technological platform from the same vendor and the management decided that the system would enable new practices, this time adapted by the Expert group members to the THC labs environment (*teleological motor*). The agents needed to start from scratch to build the system. In Phase II, boundary spanners-in-practice engaged in negotiation of trade-offs with the agents or imposed executive decisions (*dialectics motor*) when needed, to advance the project. The outcome of the ISD process was that management accepted to have a system that enabled a main set lab practices (lab protocols) and accommodated a number of "workarounds" necessary for some idiosyncratic procedures and the particular "order entry" procedure at the Paediatric site (*decisional adjustment* – mix of transformation and preservation PMI approaches).

In Case 3, management took the decision to have a common system (CIS) that would provide a single point of access to relevant patient information (outset Phase IA - *teleological motor*). During Phase IA the agents engaged in processes of translation and transformation knowledge sharing to identify common understandings about their practices and negotiate shared interests (*dialectics motor*). At the end of Phase I, the management took the decision that three of the departments will have access to the new system. The physicians that were members of the Clinical Advisory Committee recommended these departments. By doing this, the management was hoping to better promote the new IS to the rest of THC clinicians (*decisional adjustment*). Phase IB was characterized by the negotiations of common interests lead by the boundary spanners-in-practice (*dialectics motor*). The ISD outcome was that management accepted to implement a system that was reflecting a main set of practices to access site-based patient information for the nurses, and "best-of-all" practices for the physicians that were able to have a single point of access to patient information across the boundaries of the three main THC sites (*decisional adjustment* – mix of transformation and preservation PMI approaches).

In this chapter, our aim was to illustrate the processual and multilevel aspect of our theory. We posited that events and actions at the group (ISD) level were affected by and in turn affected decisions taken at the organizational level. We showed how, at the organizational level, a transformation PMI approach affects the nature of the

knowledge boundary and how agents involved in post-merger ISD will engage in an iterative process of knowledge sharing. The evidence suggests that agents' only understanding of what is at stake in their own field of practice will result in the preservation of the old boundaries, and only boundary spanners-in-practice were successful when claiming "authoritative knowledge".

In the next and final chapter, we provide conclusions and present the practical implications of our theory, developed for managers who are interested in shaping IS development practices to achieve the most desirable outcomes. Then we discuss the contributions of our study to IS and Organizational research. Limitations of our study and directions for future research are provided at the end.

CHAPTER 7: Conclusion, Contributions and Limitations

7.1 Conclusion

We began this dissertation by observing that research suggests that PMI problems are often related to the "issue of boundary management" (Haspeslagh and Jemison 1991). The review of the literature on PMI revealed that researchers who examined the "issue of boundary management" have not explored the notion of boundaries. In most studies, boundaries themselves have been taken for granted. Also, in those studies that focused on cross-boundaries knowledge sharing, the question of how individuals share knowledge was not addressed.

Our objective was to contribute to this understanding by focusing on the development of ISs aimed at supporting the merged organizations and advancing two main research questions.

The motivation to embark in this research was three-fold. First, irrespective of the integration approach adopted for a merger, new ISs that will span the boundaries of previously independent organizations will have to be developed. The literature suggests that building such systems is indeed difficult, mainly because of the incompatibility of the merging parties' ISs, which makes the integration task most challenging. Second, although research stresses the importance of the role of ISs to support the combined organizations (Mehta and Hirschheim 2007), the issue of boundary management during the development of an IS during PMI has not been studied. Third, it has been shown, albeit not in a PMI context, that knowledge sharing during ISD involving agents from different fields of practice is both critical and difficult (Karsten et al. 2001; Levina and Vaast 2006).

We developed a multi-level and processual framework based on a practice perspective and we proposed three propositions. The framework operates at two levels, the organization and the ISD project. At the organizational level, we posited that different PMI approaches influence the nature of the knowledge boundary, thus creating demands on the types of knowledge sharing processes and boundary objects that the agents involved in an ISD will require for adequate knowledge sharing, as well as on the role of the boundary spanners. At the ISD level, we conjectured that agents,

as boundary spanners, will try to convert their accumulated intellectual capital into symbolic capital to make claims about who holds relevant knowledge and create a model of practices that, when incorporated in the new IS, reinforces those claims. Thus, the initial configuration of the IS that reflects practices related to a specific PMI approach may be different from the final configuration at the end of the ISD process.

We undertook a multiple-case study within a large teaching healthcare centre resulting from the merger of five hospitals. The cases involved three processes of IS development and implementation. The results showed that although in all three cases the intended PMI approach was transformation, a hybrid approach was implemented.

Our theory, based on the three proposed propositions plus three others that emerged from data analyses, helped up to recognize that there is a dilemma of integration versus autonomy when dealing with ISD in a PMI context and a hybrid integration approach might be the appropriate answer. By providing a processual perspective, out theory also confirms that micro- and macro-levels of analysis can be simultaneously studied by focusing on "how macro-phenomena are constituted by micro-interactions, and how those micro-interactions, in turn, are shaped by macro-influences and effects" (Schultze and Orlikowski 2004: p.88). At the THC, organizational-level decisional events, such as the choice of PMI approach, had an impact on how the functionality of new ISs was developed at a group level, and how those organizational-level events, in turn, were shaped by group-level events.

Our intended contribution was to propose a research agenda on knowledge sharing during ISD in post-merger integration settings. We conclude by returning to the one of the underlying premises of the practice perspective, that is, where practices are not shared, individuals have different assumptions, outlooks and interpretations of the organizational context. Thus, cross-boundary knowledge sharing in a post-merger context involves the negotiation of multiple domains of knowledge by the professional community members that usually have an understanding of only part of the other domains beside their own communal domain of knowledge.

While there are certainly other topics that enlighten understanding of IS development in specific organizational contexts, we found fascinating how the differences in the understandings of others' practices, in personal status, and in

organizational values, norms and symbols can have such an impact on the process of IS development in PMI settings.

7.2 Implications for Practice

In addressing the practitioners, first, this research emphasized that while it is paramount to develop and implement ISs with functionalities that enable post-merger practices, management would be in a better position to make a decision regarding the integration approach if it understood why similar business process worked differently in the previously independent organizations. During the PMI phase, organizations engage in IS initiatives that seek to implement new and/or consolidate existing information systems that will integrate, to a certain degree, practices shared by different communities based on the same profession (Granlund 2003). Despite the fact that professional-based communities, for example physicists or microbiologists, are usually considered global, they tend to promote practices that have a local character based on an organizational context (Knorr-Cetina 1999). The members of these communities develop ways of working that enable effective local communication, but create barriers to global communication (Brown and Duguid 2001). For instance, in her ethnography study of microbiologists, Knorr-Cetina (1999) shows how local professional communities (microbiologists in a research lab) develop idiosyncratic ways of working on the same task or problem, that in the same time foster an effective local communication and erect barriers to global communication. The THC merger created the same problem that was found in Knorr-Cetina's (1999) empirical study. In Case 2, even though the lab technicians' practices were sanctioned by a set of industry standards, each site-based lab staff engaged in practices that had a local character based on the old organizational context.

In this context, managers who lead the development and implementation of ISs that need to bridge pre-merger practices or enable new practices need to organize another type of boundary-spanning activity: knowledge sharing about each local professional community practice. In this vein, the cross-community members of the project team need to acknowledge and understand others' old organization affiliations in terms of identity and symbolic meanings and reflect on their own past experiences in order to generate useful common knowledge required for IS development.

Second, we consider that "knowing" has vital importance for organizational knowledge in PMI settings: it does not reside in routines, expertise or skill, and it can't be conceptualized solely as tacit knowledge. Rather, knowledge that is embedded in practices must be managed taking into consideration its contextualized nature (Brown and Duguid 2001). Our research provides additional empirical evidence regarding the growing body of literature that emphasizes the importance of emergent knowledge sharing practices (Cook and Brown 1999; Orlikowski 2002). Our focus on the practice-based nature of knowledge sharing helps to explain the limitations of some existing practitioner-oriented approaches based on the "capture" of knowledge during the PMI phase (Ranft and Lord 2002; Leroy and Romanantsoa 1997). Such approaches seek to place a value on knowledge, which is independent of its embeddedness within practice and those contexts where its value is actually greatest. Managers who are responsible for knowledge management in organizations should not only create a deliberate strategy for effective knowledge sharing, but should also pay close attention to ongoing everyday "knowing" sharing practices. The roles that they play will be, however, quite different. Instead of planning and pushing certain knowledge sharing patterns, management needs to take a much more facilitative role.

7.3 Contributions to IS Research

Collaboration in multi-party IS development efforts is an important topic in IS research (Levina and Vaast 2008). First, this research contributes to the body of literature on IS development by focusing on the process of knowledge sharing at the boundary during collaboration efforts on ISD projects.

Second, by adopting a practice perspective we explained the outcomes of the three ISD processes in terms of final IS functionality by examining the practices that these ISs were supposed to reflect. Only through the lens of the practice perspective, were we able to see that the functionality of these ISs reflected agents' understandings of the others' practices as they were influenced by the relational properties of knowledge at the boundary and the differences in symbolic capitals on each side of the boundary.

Third, this dissertation contributes to the IS literature on PMI by providing an in-depth examination of the dilemma of integration versus autonomy during ISD. While

the IS literature on PMI remains silent, the practitioner literature suggests that such a dilemma exists at the IS function level (Worthen 2007). The analysis of the three ISD projects at the THC revealed that indeed, the process of developing ISs that need to reflect practices related to the planned integration approach is a very sensitive and complex endeavor. This is due to the fact that the agents in the three cases had to share their "knowing" at a pragmatic boundary. The "knowing" was part of the practices, norms, values and organizational symbols of each of the three fields of practice. Our study findings suggest that the dilemma of IS integration versus autonomy must be addressed when the novelty of the PMI context is high by engaging the project team members in an iterative process of assessing, transferring, translating and transforming the increasingly complex knowledge at the boundary.

Fourth, our literature review of the IS literature on PMI revealed that with the exception of Mehta and Hirschheim's (2004) article, the other articles advance mono-lens theories of change. Organizational change, however, is difficult to explain without recourse to several theoretical lenses that are often used separately in analyzing a single process (Lapointe and Rivard 2007). It has been suggested that a composite theory with a multi-level combination of "motors" will accurately describe the "what", "how" and "why" of organizational change (Poole and Van de Ven 2004). We developed a dual-motor process theory that provides an explanation of how organizational-level decisional events, such as the choice of PMI approach, the impact on how the functionality of new ISs will be designed and developed at a group level, and how those organizational-level events, in turn, are shaped by the group-level events and effects.

7.4 Contributions to Organizational Research

The main contribution of our dissertation to organizational research is by providing an additional, detailed example of practice perspective application in a specific organizational context, the PMI, and illustrating its utility in the investigation of a complex organizational phenomenon. Our framework clarifies the notion of boundary by addressing the level of knowledge complexity at the boundary. The practice perspective on boundaries developed in our research focuses on the notion of boundaries that exists in individual minds as well as objectified in practice, in

documents, norms, and organizational symbols. Through the notion of field, we shed light on how and why boundaries are salient in the given logic of different practices in PMI settings.

Second, the extant literature on PMI indicates that mergers suffer a high failure rate and one of the main reasons is ineffective knowledge sharing (Yoo et al. 2007; Empson 2001). Yet, there has been little research into managerial choices of PMI approaches and how they affect practices of knowledge sharing and what makes these choices difficult and ineffective. The fact that the transformation PMI approach adopted at THC created a pragmatic knowledge boundary should constitute food for thought for researchers assessing factors that impact merger outcomes.

In 1988, Nahavandi and Malekzadeh proposed a PMI process model focused on the acculturation process, explaining that the acculturation process occurs at the group and individual levels in the three stages of contact, conflict, and adaptation. Our longitudinal study showed little evidence of adaptation and acculturation, even after more than ten years of interaction and repeated attempts at structural reorganizations and implementation of new practices. The fact that some individuals still engaged in various symbolic discourses of "group-making" suggests that at the THC, the old organizational identities are still present in the minds of some of their members. This may answer the absence of the acculturation in the THC PMI integration process.

7.5 Limitations and Directions for Future Research

The main limitation of this study is that it provides generalizability of the conclusions from empirical statements to theoretical statements in developing a process theory from case studies (Lee and Baskerville 2003). To offer statistical generalizability (Yin 2003), our findings need to be validated against a variety of merger situations.

There are several avenues for future research based on the findings of this dissertation. THC was a unique setting in many respects and it would be fruitful to continue building the theory developed in this study based on data from other PMI settings in different industries. Looking at industry level data and data from other settings may help overcome this limitation and provide new insights.

Post-merger knowledge sharing can be, in part, attributed to path dependence. It has been found that organizational members tend to reuse knowledge (Carlile 2004). Future research, particularly on post-merger knowledge sharing, needs to explicitly consider the path dependent nature of post-merger behaviours during empirical analyses.

Finally, our study brings new evidence to the growing body of literature on "knowledge-in-practice" sharing (Orlikowski 2002; Österlund and Carlile 2005). Future knowledge sharing research needs to explore knowledge sharing as an outcome of dynamic interactions between the managerial choices and employee "knowing".

Post-merger integration is a journey, not a discreet one-time event (Yu et al. 2005). In this vein, we consider that a cross-disciplinary, processual and multi-level perspective can help IS researchers understand the complex process of post-merger IS integration and its interdependence with the business integration process. However, in adopting this approach, they should rigorously adopt and define out-of-discipline concepts and take into account methodological issues, such as the analysis of the process data, implied by a process theory approach.

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APPENDIX A: Synthesis of the Literature on PMI (1988–2008) - Organizational Structures Perspective (OS)

Appendix A-1. Organizational Structures Perspective (*Variance Models*)							
Focus	**Main Research Streams**	**Level of Analysis***	**Logical Structure Variance**		**Main arguments**	**Sources**	**Methodology**
			Dependent variable	**Key Independent variables****			
Effects on Organizations & Personnel	**Management of Structural & HR Differences**	O	Merger Outcomes: ▪ Merger Performance	(+) Compatibility of management styles (NS) Differences in reward and evaluation systems	Compatibility of management styles will negatively influence the performance. Differences in reward and evaluation systems do not significantly influence the acquisition performance in a negative manner.	Datta (1991)	Survey
			▪ Acquired company survival	(+) Corporate entrepreneurship	The higher the level of corporate entrepreneurship, the more likely the success of the merger.	Thomson and McNamara (2001)	Case study
			▪ Financial Performance ▪ Integration Effectiveness	(+) Autonomy removal and commitment	Levels of commitment and autonomy removal had a positive relationship with integration effectiveness and financial performance.	Weber (1996)	Survey
			▪ Nature of structural change	(+) Self-reported reasons for the merger (+) Restructuring patient care departments, programs and staffing (+) staff downsizing	Post-merger organizational integration (restructuring; reorganization) must reflect current US market realities.	Bazzoli et al. (2002)	Survey
				(-) Management of psychological contract	Study reveals the importance of the management of the existing psychological contracts in order to obtain the desired post-merger outcomes.	Shield et al. (2002)	Action research
			▪ Level of turnover ▪ Types of integration mechanisms	(+) National origins of the buying organizations	Integration mechanisms – managerial transfer, structural control, resource control, strategic control and socialization – reflect buying organizations' different national heritages in the case of cross-national mergers.	Lubatkin et al. (1998)	Case study

* Legend: I – Individual; G – Group; O – Organizational
** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

Focus	Main Research Streams	Level of Analysis*	Logical Structure Variance		Main arguments	Sources	Methodology
			Dependent variable	**Key Independent variables****			
			Job status: ▪ Management turnover	(+) Autonomy Removal (-) Post-merger status bestowal	Relative standing (managers' perception of removal of autonomy) is positively linked to post-merger top management turnover. The post-merger status bestowal has a negative impact on management turnover.	Lubatkin et al. (1999); Hambrick and Cannella (1993)	Case study Modelling
			▪ Management retention	(+) Integration strategies	Whether the acquiring firm should pursue a retention strategy of top management depends on the type of integration strategy.	Siehl and Smith (1990)	Conceptual
	Management of Cultural Differences	O	▪ Merger Performance	(-) Perceived cultural differences	The literature on culture fit reveals that cultural differences have significant positive and negative relationships with different dependent variables.	Chatterjee et al. (1992) Weber and Camerer (2003)	Event Study Lab Experiment
			▪ Management turnover	(+) Perceived cultural differences		Lubatkin et al. (1999)	Survey
			▪ Integration Effectiveness	(-) Perceived cultural differences		Weber (1996)	Survey
			▪ Acculturation	(-) Autonomy removal (+) Relatedness (+) Relative size (+) Social controls National culture: (-) US; (+) Swedish (-) Cross-nationality	Cultural clashes can be solved through socialization activities that at the same time allow autonomy.	Larsson and Lubatkin (2001)	Case-study survey
				(-) Management of psychological contract	Careful management of psychological contracts will close the cultural gap	Shield et al. (2002)	Action research

Appendix A-1. Organizational Structures Perspective (*Variance Models*)

* Legend: I – Individual; G – Group; O – Organizational
** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

Appendix A-1. Organizational Structures Perspective (*Variance Models*)

Focus	Main Research Streams	Level of Analysis*	Logical Structure Variance		Main arguments	Sources	Methodology
			Dependent variable	**Key Independent variables****			
Effects on Individuals	**Management of Behavioral Differences towards the Merger**	I	▪ Perceived uncertainty, stress, lack of job satisfaction and commitment	(+) Merger announcement without a communication intervention (-) Communication intervention	In the experimental group - plant (communication intervention), the employees' reaction (perceived uncertainty and high levels of stress) to the merger announcement stabilized over time, whereas in the control group - plant (no communication intervention), the employees' reactions deteriorated over time.	Schweiger and Denisi (1991)	Field experiment
			▪ Level of positive/negative attitude towards the merger	(+) Level of cultural learning interventions	Cultural differences can be bridged during the process of integration with three different types of cultural interventions; Deep-level cultural interventions were found to be keys to successful integration.	Schweiger and Goulet (2005)	Field experiment
			▪ Organizational identification	(-/+) Perceived inter-org differences (+/-) Pre-merger identification	Results suggest that post-merger organizational identification depends on a sense of continuity of identity. This sense of continuity is found to be contingent on the extent to which the individual's pre-merger organization dominates, or is dominated by, the merger partner.	van Knippenberg et al. (2002)	Survey
			▪ Behavior that supports integration	(+)(-) Conversational patterns and perception of partners	Theoretical framework asserts that the relationship between conversational framing (affect, discursive patterns, and negotiations of position) and patterns is mediated by the level of integration and cultural differences. Perception is everything and change in organizations is often the result of interpretations.	Dooley and Zimmerman (2003)	Conceptual
			▪ Level of protectionism within the project team during the post-merger integration	(-) Trust (+) Attitudes related to confidentiality agreement (feeling of inclusion; membership; responsibility;	Some team members experienced stress due to the dichotomy of, on one side, the need to communicate, and on the other side, to hold back information because of the conditions imposed by	Harwood and Ashleigh (2005)	Case study

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** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

Appendix A-1. Organizational Structures Perspective (*Variance Models*)							
Focus	**Main Research Streams**	**Level of Analysis***	**Logical Structure Variance**		**Main arguments**	**Sources**	**Methodology**
			Dependent variable	**Key Independent variables****			
			planning	exclusivity).	the confidentiality agreement.		
			▪ Managerial success expectation	(+)(-) Agreement judgments (perceived agreement; actual agreement; accuracy; internal agreement) (+)(-) Contextual factors (task and involvement).	Complexity of the construct agreement involves that the perceived agreement is measured at the individual level whereas actual agreement and accuracy are analyzed at the group level. The relationship between agreement and the contextual factors affects the sign of the link between agreement and success expectation.	Shanley and Correa (1992)	Case Study
		I+O	▪ Job Satisfaction ▪ Organizational citizenship behavior ▪ Turnover intention ▪ Health complaints ▪ Organizational citizenship behavior	(+)(-) Post-merger organizational identification (-) Socio-emotional orientation (+) Job insecurity (+) Socio-emotional orientation.	The study's results illustrate how organizational identification and job insecurity mediate the relationship between pre-merger communication and routines continuity on one hand, and merger impacts on individuals on the other hand.	Van Dick et al. (2006)	Survey
			▪ Acceptance of change	(+) Change management strategies (+) Perceived leadership	Changes in the management of change practices will affect organizational culture that will cause individuals to accept or reject the changes and impact individual perception of leadership.	Kavanagh and Ashkanasy (2006)	Mix of qualitative and survey
		G	▪ Resistance to merger	(-) Group Cohesion (-) Group Performance	Resistance to business mergers is greater among members of more cohesive or successful groups	Haunschild et al. (1994)	Lab Experiment

* Legend: I – Individual; G – Group; O – Organizational
** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

Appendix A-2. Organizational Structures Perspective (*Process Models*)							
Focus	**Main Research Streams**	**Level of Analysis***	**Logical Structure Process**		**Main arguments**	**Sources**	**Methodology**
			Process Outcomes	**Components**			
Effects on Organizations & Personnel	**Management of Structural & HR Differences**		*No Articles Found*				
	Management of Cultural Differences	O	▪ Post-acquisition integration	▪ Power asymmetries ▪ Cultural distance ▪ Strategic factors (scope and extent of integration)	Advance a process framework that links organizational strategies to cultural and power issues that emerged during the post-acquisition integration process in order to provide a better understanding of the acquisition cultural risk.	David and Singh (1993)	Case study
			▪ Acculturation modes	▪ Integration strategies ▪ Forces of cultural differences ▪ Post-acquisition performance	The framework emphasizes the fact that acculturation is a process not an outcome and different acculturation modes are function of the post-acquisition performance, the dynamic nature of the forces behind cultural differences and the various integration strategies adopted.	Elsass and Veiga (1994)	Conceptual
			Organizational culture	▪ Discourse ▪ Power ▪ Differences in culture ▪ Organizational Identity	Organizational culture is analyzed as a discursive formation (Foucauldian approach) within a process of disciplinary normalization during the post-merger integration (regime of truth).	Riad (2005)	Ethnography
					Individuals in post-merger settings are simultaneously both united and divided – a dialogic perspective on organizational culture differences.	Riad (2007)	Ethnography
Effects on Individuals	**Management of Behavioral Differences towards the Merger**	I + O	▪ Post-merger emotional & cognitive adjustment	▪ Organizational identity continuity ▪ Psychological contract	The theoretical framework links organizational identity continuity (through processes of sensemaking) and psychological contracts to post-merger emotional and cognitive adjustment.	Millward and Kyriakidou (2004)	Conceptual

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** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

APPENDIX B: Synthesis of the Literature on PMI (1988–2008) – IT/IS Integration: OS Perspective

Appendix B-1. IT-IS Integration: Organizational Structures Perspective (*Variance Models*)

Focus	Main Research Streams	Level of Analysis*	Logical Structure Variance		Main arguments	Sources	IT Artifact (Orlikowski and Iacono , 2001)	Methodology
			Dependent variable	Key Independent variables**				
Effects on Organizations & Personnel	Management of Structural & HR Differences	O	▪ IS staff integration	(-) IS personnel reduction (-) Level of workload (+) Incentive mechanisms (-) Cultural differences (-) Career uncertainty (+) Level of communication (+)(-) IS integration planning approaches (-) commitment to work (-) level of innovativeness (-) Stress (-) Autonomy removal	The framework identifies the factors affecting post-merger integration of IS personnel, the challenges/opportunities during this process and managerial interventions.	Alaranta and Viljanen (2004)	Tool view	Conceptual
			▪ Merger effectiveness	(+) Level of IS integration	The level of IS integration is related to the level of effectiveness of the merger.	Weber and Pliskin (1996)	Nominal view	Survey
	Management of Cultural Differences	O	▪ Merger effectiveness ▪ Level of IS integration	(-) Cultural differences	Organizational culture impacts the outcomes of IS integration and the merger overall.	Weber and Pliskin (1996) Alaranta and Viljanen (2004)	Nominal view	Survey
Effects on Individuals	Management of Behavioral Differences towards the Merger	I	▪ Post-merger IS use	(+)Attitude (+) Subjective norms (+) Perceived behavioral control (-) Risk	Findings confirm Theory of Planned Behavior tenets.	Huang and Chuang (2007)	Proxy view	Survey

Table B-2. IT-IS Integration: Organizational Structures Perspective (*Process Models*)

Focus	Main Research Streams	Level of Analysis*	Logical Structure Process		Main arguments	Sources	IT Artifact (Orlikowski and Iacono , 2001)	Methodology
			Process Outcomes	Components				
No articles found								

* Legend: I – Individual; G – Group; O – Organizational
** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

APPENDIX C: Synthesis of the Literature on PMI (1988–2008) – Integration Design (ID) Perspective

Appendix C-1. Integration Design Perspective (*Variance Models*)							
Focus	**Main Research Streams**	**Level of Analysis***	**Logical Structure Variance**		**Main arguments**	**Sources**	**Methodology**
			Dependent variable	**Key Independent variables****			
Management of Differences	**Contingency Integration Frameworks**	O	Merger Outcomes: ▪ Post-merger performance (metrics)	(+) Task integration (+) Human Integration (+)(-) Integration strategies	Merger success is a factor of task integration and human integration. However, a suboptimal level of success will be attained if either human or task integration will be achieved ahead of the other.	Birkinshaw et al. (2000)	Multi-case study
				(+) Post-acquisition changes in management practices	Changes in management practices have a significant impact on post-acquisition performance.	Child et al. (1999)	Survey
				(+) Strategic Fit (+) Level of transfer of managerial competencies (+) Effectiveness of external advice (-) Cultural differences	Lack of post-merger integration suggests that value creation must rely on transfer of skills; Need to overcome cultural differences.	Norburn and Schoenberg (1994)	Survey
				(-) Environment hostility (+) Merger consequentiality (+) Structural formalization (+) Size of the acquiring firm (+) Existence of a communication program (-) Post-merger employees turnover	Results show that among the more influential factors that affect implementation success are the communication program, the external corporate environment, the formalization of the decision-making process and the consequentiality of the merger	Papadakis (2005)	Survey
				(+) Knowledge codification (+) Level of integration (NS) Merger experience (-) Management replacement	Provide knowledge-based view of how various post-merger integration decisions regarding replacing management and capability building affect the performance	Zollo and Singh (2004)	Secondary data
			▪ Perceived post-merger performance	(-) Level of formalization of management decisions (-) Turnover of key personnel (+) Lines communication (+) Level of Integration	Management planning, effective lines of communications and organizational factors determine the realization of the potential synergies.	Chakrabarti (1990)	Field Survey

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** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

Appendix C-1. Integration Design Perspective (*Variance Models*)

Focus	Main Research Streams	Level of Analysis*	Logical Structure Variance		Main arguments	Sources	Methodology
			Dependent variable	Key Independent variables**			
			▪ Synergy realization	(+) Prior understanding of the acquired business (+) Perceived benefits from acquisition (NS) Merger motives (+) Integration of economic factors (+) Integration of social factors	The author advances the Social and Economic Approach to Management (SEAM) framework as an efficient management tool for analysis of the social and economic factors during the planning of a merger.	Buono (2003)	Conceptual
				(+) Combination potential (+) Organizational integration (-) Employee resistance	An integrative model for M&A success is empirically supported and confirms the argument that researchers should simultaneously consider strategic, organizational and HR explanations when assessing M&A success.	Larsson and Finkelstein (1999)	Case-study survey
				(+) Hybrid integration approach (depending on the nature of merging parties' capabilities)	Due to the complexity nature of mergers, companies need to apply a hybrid post-merger integration approach with simultaneous segmentation at a different pace across different org. structures.	Schweizer (2005)	Conceptual
			▪ Knowledge Transfer	(-) Knowledge tacitness (-) Autonomy (+) rich communication	Assess how the nature of merging companies' knowledge and various dimensions of post-merger integration process affects knowledge transfer	Ranft and Lord (2002)	Multi-case study
			▪ Acquisition of Knowledge and Innovative capabilities	(-) Slow post-merger integration (+/-) Structural integration	Merged organizations leverage acquired technology assets in two distinct ways; they may leverage the existing knowledge (what they know) and/or its capabilities for ongoing innovation (what they do); Structural integration has a negative impact on the acquirer's attempts to leverage innovative capabilities, but has a positive impact on the leveraging of existing	Puranam and Srikanth (2007)	Secondary data

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** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

Appendix C-1. Integration Design Perspective (*Variance Models*)

Focus	Main Research Streams	Level of Analysis*	Logical Structure Variance		Main arguments	Sources	Methodology
			Dependent variable	**Key Independent variables****			
					knowledge.		
			▪ Level of acculturative stress	(+/-) separation (+/-) integration (+/-) assimilation (+-) deculturation	Propose an acculturation model that advances four approaches to PMI: separation, assimilation, integration, and deculturation. The degree of congruence between the merging parties' preferred modes of acculturation affects the level of acculturative stress	Nahavandi and Malekzadeh (1988)	Conceptual
	Integration Process Design	O	Process design outcomes: ▪ Level of integration	*Strategic factors*: (+) relatedness *Political factors*: (+) size of the acquired firm (-) pre-merger performance of the acquired firm *Cultural factors*: (-) Perceived cultural differences (+) Type of national administrative heritage (-) cross-border merger (+) national merger (+) Strategic tasks needs	The different post-merger integration strategies have a contextual nature; The three categories of factors explain in a complementary manner the mechanisms of the post-merger integration.	Calori et al. (1996)	Survey
				(-) organizational tasks needs (-) Differences in culture (-) Compatibility of the acquisition vision (+) Power differential	Task-related variables were dominant in influencing decision-making models, followed in importance by cultural and political factors; Outcomes imply the importance of a multi-lens analysis of the integration design decisions.	Pablo (1994)	Survey Policy-capturing technique
				(+) Organizational fit (+) Degree of cohesion (-) Retention of the old organizational identity (+) Leadership (-) perceived cultural differences	Leadership, symbolic reconstruction of a new identity, super-ordinate goals, and multi-group membership (cohesion) will facilitate integration.	Olie (1994)	Case study

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Appendix C-1. Integration Design Perspective (*Variance Models*)

Focus	Main Research Streams	Level of Analysis*	Logical Structure Variance		Main arguments	Sources	Methodology
			Dependent variable	**Key Independent variables****			
		I		(-) Perceived riskiness of candidates of integration approaches (-) Risk propensity	Propose a theoretical model that, by including risk as an independent variable, better explains individual decision-making behaviors.	Pablo et al. (1996)	Conceptual
	Organizational Learning	O	▪ Merger Performance	(-) Acquisition experience (+) Similarity with prior acquisitions	The behavioral learning theory applied in this study allowed the authors to develop a contingency model that proposes different effects of the acquisition experience on the acquisition performance.	Haleblian and Finkelstein (1999)	Secondary data
				(-) Acquisition experience (-) Similarity with prior acquisitions (+) No. of small prior acquisition losses	Prior acquisition experience is a necessary but not sufficient condition for acquirer learning.	Hayward (2002)	Secondary data
				(+) Knowledge transfer	Experience-based assets did not influence the rate of acquisition survival; Knowledge transfer from the acquirer to the acquired is a key factor for acquisition survival.	Hebert et al. (2005)	Secondary data
		I	▪ Level of post-merger individual learning	(+) Emphasis on perceived prerequisite managerial skills	In the context of international mergers, language and cultural differences will moderate the relationship between perceived managerial skills requirements and individual learning.	Villinger (1996)	Survey
	Roles of Professionals	*No Articles Found*					

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** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

Appendix C-2. Integration Design Perspective (*Process Models*)

Focus	Main Research Streams	Level of Analysis*	Logical Structure Process		Main arguments	Sources	Methodology
			Process Outcomes	Components			
Management of Differences	Contingency Integration Frameworks	I + O	Merger Outcomes: ▪ Integration success	▪ Attention to organizational fit ▪ Enthusiasm for merger	Stress the importance of understanding emerging issues during the process of integration that affect individuals' perception of the utility of the merger. The organizational fit (structure, decision-making processes and culture) and not the strategic fit is important during the integration process.	Greenwood et al. (1994)	Grounded theory
		O	▪ Performance	▪ Redesign of operational structures and operational processes	The redesigning of the organizational structures and operational processes is paramount to achieving successful post-merger integration.	Baroncelli (1998)	In-depth case study
				▪ Merger type ▪ Type of HR practices	Proposes a framework that suggests that merger motives will relate to the merger type (extension, collaborative, design), which in turn will affect how changes in HR practices are performed and ultimately the performance of the merger.	Napier (1988)	Conceptual
				▪ Strategic restructuring ▪ Defensive restructuring ▪ Nature of knowledge (tacit vs. explicit) ▪ Management practices	Strategic restructuring (autonomy and complementary resources) as opposed to defensive restructuring (short-term efficiency, downsizing) was found to be linked to positive levels of performance.	Meyer and Lieb-Doczy (2003)	Multi-case study
	Integration Process Design	O	Process design outcomes: ▪ Diffusion of managerial ideas (post-merger integration strategy)	▪ Rational explanations ▪ Political arguments ▪ Institutional arguments	During the post-merger period the agency advances political arguments (through rational and institutional explanations) to legitimize the diffusion of managerial ideas.	Comtois et al. (2004)	Multi-case study
			▪ Organizational outcomes: the "myth" (merger) is "sedimented"	▪ Antecedent (institutional logics) ▪ Mobilization (decisional legitimacy) ▪ Establishment of Myths (isomorphism)	A multi-disciplinary approach to extend neo-institutional theory to explain merger adoption in academic hospital centres. Managers select legitimized recipes for mergers through conformance to a myth (mimetic mechanisms) and invoke institutional pressures in order to create decisional legitimacy.	Kitchener (2002)	Case Study

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** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

Appendix C-2. Integration Design Perspective (*Process Models*)

Focus	Main Research Streams	Level of Analysis*	Logical Structure Process		Main arguments	Sources	Methodology
			Process Outcomes	**Components**			
			• Post-merger integration process outcomes	• External integration patterns • Internal integration patterns • Emergent conflicts	Using a dual lens, structural view of attention and sensemaking, this study identifies patterns of emergent issues that trigger managers' attention during the post-merger integration process. It also provides a better understanding of how managers make sense of those issues over the time and how their sensemaking alter the course of action of the integration process.	Yu et al. (2005)	Ethnography
			• Achievement of symbiosis integration approach	• Decision-making Control • Decision-making Style • Decision-making Speed	The relationship between the adopted merger integration approach and the related decision-making processes for the outcomes of the post-merger integration	Lundbäck and Hörte (2005)	Case study
				• Clearly defined objectives • Clearly defined actions	A successful post-merger integration requires a phase-based process of integration with clearly defined objectives and actions.	Quah and Young (2005)	Case study
			• Level of integration	• Past evolutionary patterns • Past forces • Past processes	From an evolutionary perspective results show that post-merger decisions and outcomes are determined by evolutionary patterns, forces and processes initiated in the past.	Ruhli and Sachs (1999)	Case study
			• Nature of integration decision-making • Synergies achievement	• Integration strategies	Appropriate integration strategies foster individual learning and acculturation processes which implicitly decrease the individual uncertainty and increase the motivation to cooperate. Acculturation and commitment are key determinants of successful synergy creation.	Salama et al. (2003)	Multi-case study
			• Effective integration	• Inherent ambiguity • Cultural confusion • Organizational hypocrisy • Issue politicization	Four "irrationalities" (specific characteristics of post-merger decision-making) affect the outcomes of the post-merger integration process.	Vaara (2003)	In-depth case study

* Legend: I – Individual; G – Group; O – Organizational
** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

Appendix C-2. Integration Design Perspective (*Process Models*)

Focus	Main Research Streams	Level of Analysis*	Logical Structure Process		Main arguments	Sources	Methodology
			Process Outcomes	**Components**			
			▪ Interpretations of the integration process	Types of discourse: rationalistic, cultural, role-bound, and individualistic	The analysis reveals discursive frameworks based on narratives that portray how decision-makers reconstruct and reinterpret the events related to the integration process and its outcomes.	Vaara (2002)	In-depth case study
	Organizational Learning	I+G+O	Outcomes of the organizational learning process	▪ Cognitive learning ▪ Behavioral learning	An integrative model where organizational learning is seen as being part of the post-merger integration process and which implies two complementary modes: Cognitive and Behavioral; Learning is not only a rational and linear process but an emergent and experimental one as well.	Leroy and Romanantsoa (1997)	Case Study
	Roles of Professionals	I + O	▪ Implementation of change initiatives	▪ Improvisational actions ▪ Creation of networks based on social ties	Boundary-shakers, as change agents, deliberately manipulate, in an improvisational manner, their organizational contexts in order to attain their change objectives; Boundary-shakers become reliant upon the dynamics of the organizational network of relationships.	Balogun et al. (2005)	Case Study
			▪ Outcomes of the actions of the socio-political forces	▪ Emerging management role structure	The analysis of the emerging role structure within upper management reveals new understandings of the dynamics of the sociopolitical forces during the post-merger process of integration	Vaara (2001)	In-depth case study
			▪ Cultural integration	▪ Sensemaking of cultural differences	Analysis of the cultural sensemaking of the change agents during the PMI process	Vaara (2000)	In-depth case study
			▪ Achieving change (post-merger integration)	▪ Distinctive roles of the members of the collective leadership ▪ Collective leadership needs to be unified (prerequisite condition) ▪ Change has a cyclical nature	The six components represent an emerging process theory of leadership and strategic change in pluralistic and post-merger settings.	Denis et al. (2001)	Multi-case study

*   Legend: I – Individual; G – Group; O – Organizational
** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

Appendix C-2. Integration Design Perspective (*Process Models*)

Focus	Main Research Streams	Level of Analysis*	Logical Structure Process		Main arguments	Sources	Methodology
			Process Outcomes	**Components**			
				▪ Need to overcome the "leadership dilemma" ▪ Slack resources, social embeddedness, creative opportunism, and time, inattention, and formal position will contribute to the stabilization of change.			
			▪ Expected performance ▪ Serendipitous performance	Mobilizing and mitigating actions Assuming cross-organizational responsibilities	The study explores the roles of the acquired managers in the process of post-merger integration; these managers can produce through different actions two different types of value: expected and serendipitous.	Graebner (2004)	Grounded-theory
			▪ Operationalization of the post-merger integration approach	Destructive interventions of the middle management	Outcomes show destructive interventions of middle management in a failed post-merger process. The study of the Nordea merger describes a situation where the top management's strategic pre-merger planning was operationalized in divergent ways by two groups of middle management that have presented different interests that the top management.	Meyer (2006)	Case Study
			▪ Knowledge sharing	Fears of exploitation and contamination	Tries to understand the role individuals play in PM knowledge sharing, in articulating and legitimizing knowledge bases and interpreting the organizational context.	Empson (2001)	Case Study

* Legend: I – Individual; G – Group; O – Organizational
** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

APPENDIX D: Synthesis of the Literature on PMI (1988–2008) - IT-IS Integration: ID Perspective

Appendix D-1. IT-IS Integration: Integration Design Perspective (*Variance Theory*)								
Focus	**Main Research Streams**	**Level of Analysis***	**Logical Structure Variance**		**Main arguments**	**Sources**	**IT Artifact (Orlikowski and Iacono, 2001)**	**Methodology**
			Dependent variable	**Key Independent variables****				
Management of Differences	**Contingency Integration Frameworks**	O	IS integration success: ▪ IS ability to exploit merger opportunities ▪ IS ability to avoid merger problems ▪ IS assessment of success of integrated systems and integration process ▪ End user satisfaction with integrated systems and integration process ▪ IS resource utilization during the integration process ▪ Improved IS Capability	(+) CIO prior merger experience (+) IS participation in merger planning (+) Quality of merger planning (+) Criteria used for setting IS integration priorities (+) Level of data-sharing across applications (-) IS personnel change (-) Programming language incompatibilities (+) level of end-user involvement in strategic IS decision-making (+) level of IS standardization (+) Retention of IS personnel with integration expertise (+) Ability to recover from IS integration mistakes	These articles emphasize the importance of IS integration in post-merger organizations. Merger management factors were found to constitute an important role in IS integration success. The factors that influence a successful IS integration are managerial in nature and are controllable	Stylianou et al. (1996) Robbins and Stylianou (1999) Hwang (2004)	Nominal view Nominal view Tool view	Field Survey Field Survey Conceptual
			▪ IS implementation	(-) Resistance to change (+) level of expertise and resource availability (+) level of software quality and vendor expertise (+) learning capacity (+) cultural readiness (+) Level of IT leveragability and knowledge-sharing capacity (+) capacity of establish network relationships (+) IS integration management approach.	Empirical testing of the proposed model confirms Motwani's (2002) results and adds new IS success factors that are related to a company's expertise, availability of resources and capacity of learning.	Alaranta (2005)	Tool view	Case Study
	Integration Process Design	O	Process design outcomes: ▪ IT Fit	(+)(-) IT contribution of each firm involved in the merger (+)(-) Nature of relationship between the two IT environments	IT fit should be taken into consideration as much as the organization and strategic fit are. The assessment of IT fit is	Buck-Lew et al. (1992)	Tool view	Case study

* Legend: I – Individual; G – Group; O – Organizational
** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

Appendix D-1. IT-IS Integration: Integration Design Perspective (*Variance Theory*)								
Focus	**Main Research Streams**	**Level of Analysis***	**Logical Structure Variance**		**Main arguments**	**Sources**	**IT Artifact (Orlikowski and Iacono, 2001)**	**Methodology**
			Dependent variable	**Key Independent variables****				
				(+)(-) IT role during the merger especially during the organizational integration process	an important factor of the decision-making process during a merger.			
			▪ Effective post-merger IS integration strategies	(+) Level of strategic importance of the IS function (+) Organizational IS learning (+) IS integration (+) Formulation of an IS strategy (+) User participation (+) Effective lines of communication	In the case of ineffective post-merger integrations, managers involved in pre-and post-merger decision-making lack consideration for the strategic importance of IS/IT. Anticipate IS needs, plan accordingly, involve key staff, communicate objectives, review process and create learning feed-back.	Merali and McKiernan (1993) McKiernan and Merali (1995)	Nominal view Nominal view	Multi-case study Multi-case study
				(+) IS requirements (+) Organizational structure differences (+) Growth objectives (+) Situation variables	Both models (decision support and the descriptive) emphasize the two important factors that affect the process of IS integration: the level of simplicity of integration and the difference in management needs. IS integration success depends on a mix of technical and organizational factors.	Giacomazzi et al (1997	Tool view	Survey
			▪ Form of IT integration	(+) Fit of the organizational configuration of IT	The analysis reveals three IT integration strategies: best-of-breed, absorption, and co-existence that are influenced by the fit between the two merged organizational IT environments.	Johnston and Yetton (1996)	Tool view	Case Study
			▪ Type of IS integration method	(+) Level of location integration (+) Merger partners' participation in the same IT-user organization (+) Merger integration ambition (+) IT integration objectives (+) User participation (+) Type of IS	Longitudinal analysis reveals the importance of analyzing the dynamics of post-merger IT integration for formulating better theory for decision-making.	Wijnhoven et al. (2006)	Nominal view	Multi-case study

*   Legend: I – Individual; G – Group; O – Organizational
** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

Appendix D-1. IT-IS Integration: Integration Design Perspective (*Variance Theory*)								
Focus	**Main Research Streams**	**Level of Analysis***	**Logical Structure Variance**		**Main arguments**	**Sources**	**IT Artifact (Orlikowski and Iacono, 2001)**	**Methodology**
			Dependent variable	**Key Independent variables****				
			▪ Type of IS Governance	▪ 5 Strategic propositions (decisions)	Develop a set of five predictive propositions with regard to how the governance of the management of IT and management of the use of IT should be approached.	Brown and Renwick (1996)	Nominal view	Conceptual
	Organizational Learning		*No Articles Found*					
	Roles of Professionals							

* Legend: I – Individual; G – Group; O – Organizational
** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

Appendix D-2. IT-IS Integration: Integration Design Perspective (*Process Theory*)

Focus	Main Research Streams	Level of Analysis*	Logical Structure Process		Main arguments	Sources	IT Artifact	Methodology
			Process Outcomes	Components				
Management of Differences	Contingency Integration Frameworks	*No Articles Found*						
	Integration Process Design	O	▪ Management control of the IS integration	▪ Interpretive schemes ▪ Unintended consequences ▪ Goal ambiguity ▪ Cultural conflicts ▪ Dominant individuals	The results of the study deepen our understanding of the contextuality of the problems related to managerial control of the IS integration process.	Granlund (2003)	Ensemble view	In-depth case study
			▪ IT integration mechanisms	▪ Symbolic decisions ▪ Power ▪ Decisions regarding business-IT alignment	The proposed framework assesses why and how different IT integration mechanisms are adopted during the post-merger period.	Mehta and Hirschheim (2004)	Ensemble view	Multi-case study
			▪ IT integration decisions	▪ Industry context ▪ Business structure ▪ Geographical dispersion of multinationals	Examine IS Integration decision making from a business-IS alignment perspective and to identify factors that govern IS integration decisions.	Mehta and Hirschheim (2007)	Nominal view	Multi-case study
				▪ Scalability ▪ Cost ▪ Imminent loan season ▪ Reduce integration risks	Analyze the decisions re. IT integration during the IT integration planning in the case of Sallie Mae and USA Group	Brown et al. (2003)	Nominal view	Case Study
			▪ IT integration planning effectiveness	6 planning dimensions: ▪ Comprehensiveness ▪ Formalization ▪ Focus ▪ Flow ▪ Participation ▪ Consistency in the post-merger IS integration context.	Propose a framework for post-merger IS integration planning; the framework illustrates the effect of the merger context, time and differences between the merging units on the six planning dimensions.	Alaranta and Henningsson (2007)	Nominal view	Case Study
				▪ Effective partnership (shared knowledge; shared commitment; shared decision-making)	To identify the success factors of the IT integration planning during the pre-merger phase of the merger between Baxter and AHS.	Main and Short (1989)	Nominal view	Case Study
			▪ Gap between pre-merger planned and	▪ the nature of the merger ▪ a lack of shared context	The study shows that mergers represent a discontinuity in	Yoo et al. (2007)	Nominal view	Case Study

* Legend: I – Individual; G – Group; O – Organizational
** Legend: (-) Significant negative relationship; (+) Significant positive relationship; (NS) Not significant

Appendix D-2. IT-IS Integration: Integration Design Perspective (*Process Theory*)								
Focus	**Main Research Streams**	**Level of Analysis***	**Logical Structure** **Process**		**Main arguments**	**Sources**	**IT Artifact**	**Methodology**
			Process Outcomes	**Components**				
			emergent post-merger IT-based knowledge sharing approaches	▪ the incompatibility of existing knowledge systems ▪ the tacit dimension of knowledge ▪ time pressures of the merger	knowledge sharing. Planned integration approaches often mirror the learned knowledge sharing practices of one of the merged companies and match poorly with the post-merger reality of the knowledge sharing needs.			
	Organizational Learning	*No Articles Found*						
	Roles of Professionals							

APPENDIX E:

Mind the Gap: Positioning Information Systems/Information Technology within the Process of Post-merger Integration[11]

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Abstract

This paper assesses IS research on the role of Information Systems (IS) and Information Technology (IT) in the context of mergers and acquisitions (M&A). It first presents the main theoretical perspectives on M&A with an emphasis on the post-merger integration process. It then analyzes IS/IT studies in terms of their theoretical perspective, their logical structure, their knowledge relevancy, and the nature of the IS/IT phenomena studied and synthesizes what has been learned from these studies. Finally, it identifies methodological and theoretical issues and suggests research avenues.

Keywords: Information Technology; Post-merger Integration; Literature Review

Introduction

Mergers and acquisitions (M&A) are one means that an organization can use to expand and/or diversify. A *merger* usually involves full amalgamation of two or more separate organizations into a third (Marks and Mirvis 1998). An *acquisition* refers to the purchase of a target organization for absorption into the acquiring organization. The literature, be it in management, economics, business history, industrial organization, or finance generally holds the term "merger" to include both phenomena (Marchildon 1991). Hence, this paper will use the term *merger* instead of M&A.

Mergers have attracted academic interest as merger waves emerged. After a brief but sharp decline between 2000 and 2002 with deal values of $441 billion in 2002 as compared to $1.2 trillion in 2000, U.S. and U.S. cross-border global merger activity has been on the rise again with deals totaling $823 billion in 2004, $1,23 trillion in 2005, and $1.48 trillion in 2006 (Mergerstat 2007). With such sums involved, it is

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crucial that the expected synergy, that is, the sum of the net benefits created by the process of interaction of the organizations involved in the merger, indeed materializes (Larsson and Finkelstein, 1999). The success of mergers is, however, rather low, with a failure rate of almost 70% (Levinsohn 2002). Post-merger integration is viewed as the "real source of value creation; poor integration has been identified as the main cause of failures (Haspeslagh and Jemison 1991: p.167).

IT integration, in terms of IT "fit" (Buck-Lew et al. 1992), success factors (Robbins and Stylianou 1999), and integration strategies (Wijnhoven 2006), has been argued to be critical when planning and implementing a merger. Yet, studies that focus on this topic seem to be few and far between, and are largely silent on how the process of post-merger IT integration interacts with the organizational integration process. This study assesses the literature on post-merger integration in order to evaluate what we know and what we don't know on the role of IS/IT in this context. To do so, the paper presents the main schools of thought of the literature on mergers; it synthesizes the literature on post-merger IT integration by analyzing it along four dimensions; finally, it identifies methodological and conceptual issues that researchers should address when studying post-merger IT integration.

Studying Mergers: The Main Schools of Thought

Mergers comprise three phases: courtship or pre-merger, merger decision, and post-merger integration (Marks and Mirvis 1998). The first two phases include the strategic and financial analysis that would determine the potential benefits or synergies. Post-merger integration refers to the actual process of value-creation (Haspeslagh and Jemison 1991). Mergers have been the focus of studies in a number of fields, including Economics, Finance, Strategic management, and Organization Studies (OS). Over the years, researchers have analyzed the phenomenon from four perspectives that have distinct theoretical foundations and central hypotheses: 1. Finance and Economics; 2. Strategy; 3. Organization Theory; and 4. Process perspective (Haspeslagh and Jemison 1991).

The *Finance and Economics* school is concerned with potential wealth creation associated with a merger (e.g. Franks et al. 1991). The *Strategy* school advances the concept of "strategic fit" or "relatedness" which is defined as "the degree to which the target firm augments or complements the parent's strategy" (Jemison and Sitkin 1986: p.146). This school focuses on the link between merger performance and strategic attributes of the combining companies (e.g. Homburg and Bucerius 2006) and pre-merger planning (e.g. Main and Short 1989). However, counting on relatedness-based synergies, the Strategy school developed its main weakness, namely, its sustained "emphasis on the strategic task, leaving aside practical impediments to value creation such as interpersonal, inter-organizational and intercultural friction" (Haspeslagh and Jemison 1991: p.302). The *Organization Theory* school's focus is on the post-merger effects on organizational structures and work relationships and on how individuals respond to post-merger issues (Haspeslagh and Jemison 1991). This perspective regards post-merger integration in terms of acculturation (Larsson and Lubatkin 2001), attaining compatibility of management practices (Datta 1991), organizational structures (Lubatkin et al. 1998), or of mitigating issues at the individual level such as, stress, uncertainty, commitment and resistance to merger. Finally, the *Process* school provides an analytical construction of the integration process by combining organizational and

strategic elements. The proponents of this school view integration as the mechanism of coordination of the activities of the combined organizations in order to bring to fruition the potential of the interdependences that have motivated the merger (Shrivastava 1986). Contingency integration frameworks have been proposed, which examine how different integration approaches may impact the merger outcomes (e.g. Birkinshaw et al. 2000), and the effect of the emergent roles of professionals during the post-merger period on the outcomes of the integration process have been studied (e.g. Balogun et al. 2005).

In sum, while the Finance and Economics school concentrates on the potential synergies of the mergers and tends to ignore the post-merger integration process (Haspeslagh and Jemison 1991), the other three schools approach the issue of post-merger value creation differently. The Strategic perspective relies on the "relatedness" or "planning" concepts in order to attain an "elusive strategy performance linkage" (Haspeslagh and Jemison 1991: p.300). The Organization theory scholars emphasize the effects of the impact that mergers have on organizations and the behavioral response of the individuals involved, while the Process perspective stresses the fact that sound theories of merger outcomes must include not only financial and strategic factors that predict potential value, but also the dynamics of the post-merger integration process that bring to fruition the potential synergies (Javidan et al. 2004). Considering this, we only focused on the latter three schools for identifying studies on post-merger integration issues.

Literature on Post-merger IS/IT Integration

In a post-merger context, IT integration implies that "exchanges of data and organizational processes, according to the merged organizational needs, are possible and efficient" (Giacomazzi et al. 1997: p.290). The professional literature emphasizes the importance of IT integration during post-merger (Boston Consulting Group 2004). A survey of 334 senior business and IT executives involved in mergers found that IT integration was cited as the most critical factor for merger success (Curtis and Chanmugam 2005). This motivated our review of the academic literature to assess how researchers are addressing it. We conducted a two-phase literature review that covered the years from January 1987 to January 2007. First, we searched the strategic management and organization literatures for articles that focused on the post-merger integration phase, and we cross-examined the articles in order to identify studies that included IT/IS integration elements. Second, we identified, in the IS literature, articles on post-merger IT integration.

We used four main sources: 1. Databases: ABI/INFORM and Science Direct; 2. Scholarly journals that cover strategic and organizational issues: Academy of Management Journal, Academy of Management Review, Strategic Management Journal, Organization Studies, Long Range Planning, Strategic Change, Information & Management, and Journal of Strategic Information Systems; 3) The top 5 IS journals according to the MIS journal rankings provided by AISWorld Net (Saunders n.d.): MIS Quarterly, Information Systems Research, Communications of the ACM, Management Science, and Journal of MIS; 4) The "ancestry" technique of article identification (cf. Cooper 1998) which implies reviewing citations from the articles previously identified. Accounting, Auditing & Accountability journal and the proceedings of HICSS, ECIS and AMCIS were then included. The search yielded 77 articles, 18 of which focused on

IS/IT integration. These 18 articles were, with one exception (Granlund 2003), published in IS journals.

Each article was analyzed along four dimensions – described below – to better circumscribe its nature and its contribution.

Schools of thought – The articles were classified within one of the four schools of thought typology proposed by Haspeslagh and Jemison (1991).

Logical structure – The logical structure of a theoretical development "refers to the time span of theory […] and to the hypothesized relationships between antecedents and outcomes" (Markus and Robey 1988: p.584). There exist two types of logical structure: variance models and process models. Variance models hypothesize associations between predictors and outcomes. They assume that variation in predictors accounts for variation in outcomes and represents an invariant, necessary and sufficient relationship. Process models explain how outcomes of interest develop through a sequence of events (Mohr 1982). These antecedent events are necessary but not sufficient for the outcome, which are therefore only partially predictable from knowledge of the process[12].

Type of knowledge relevancy – A research paper entails a reasoned argument that presents the reader with supporting evidence for its conclusions and contains a certain level of abstraction when describing the study's tenets and methodological procedures. Drawing on the tenets of the argumentation theory (Toulmin 1958) and on the discourse of practice of relevance (Benbasat and Zmud 1999) we created a four-quadrant typology of knowledge relevancy (Figure 1), along two dimensions: the level of abstraction and the level of the knowledge's trustworthiness. Based on Benbasat and Zmud's (1999) description of "relevancy", we consider that an article can be: a) relevant to practitioners by having "implementable" implications and providing a "painless" approach (less abstraction, pragmatic tone, more real life facts) for IS professionals to access a "state of knowledge" that will be used to solve a problem or make the most of an opportunity; and b) relevant to IS researchers by stimulating critical thinking with a "scholarly" tone, and elaborated illustrations of the theoretical foundation and methodologies used. Regardless of the direction – practitioner or academia – in which an article is leaning, however, it may contain valid or flawed argumentation. Indeed, "relevancy doesn't imply that research needs to be carried out in a less rigorous fashion" (Benbasat and Zmud 1999: p.5). In this vein, we assessed also the knowledge trustworthiness of an article in terms of correctness of use of appropriate methods and analyses (Benbasat and Zmud 1999) and validity of the logic of argumentation. For the latter, we used Hart's (2001) six prerequisites for an article to be considered as having a sound logical structure: a reliable structure to sustain proper argumentation; clear concept definition; reasons for claims; substantiated assumptions; avoidance of logical fallacies; use of legitimate and relevant, not anecdotal, evidence. The four quadrants are:

Q1: The Anecdotal – The articles in this view are often characterized as "popular literature" that advance claims based on "anecdotal" evidence;

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[12] The Process school perspective on mergers and the Process model as a type of logical structure of a theoretical model are two different and unrelated concepts.

Q2: The Less Rigorous –The articles categorized in this quadrant challenge reader's causal assumptions with interesting ideas but based on unclear arguments, or in the case of empirical studies, by inappropriate or/and less rigorous methodologies.

Q3: The Implementable – The authors' argumentation is prescriptive without much abstraction. The articles that fit this description, even though they are published by scholarly journals, target mainly the practitioner audience;

Q4: The Critical Thinking – These articles present a high level of rigor and knowledge trustworthiness and are published by top academic journals.
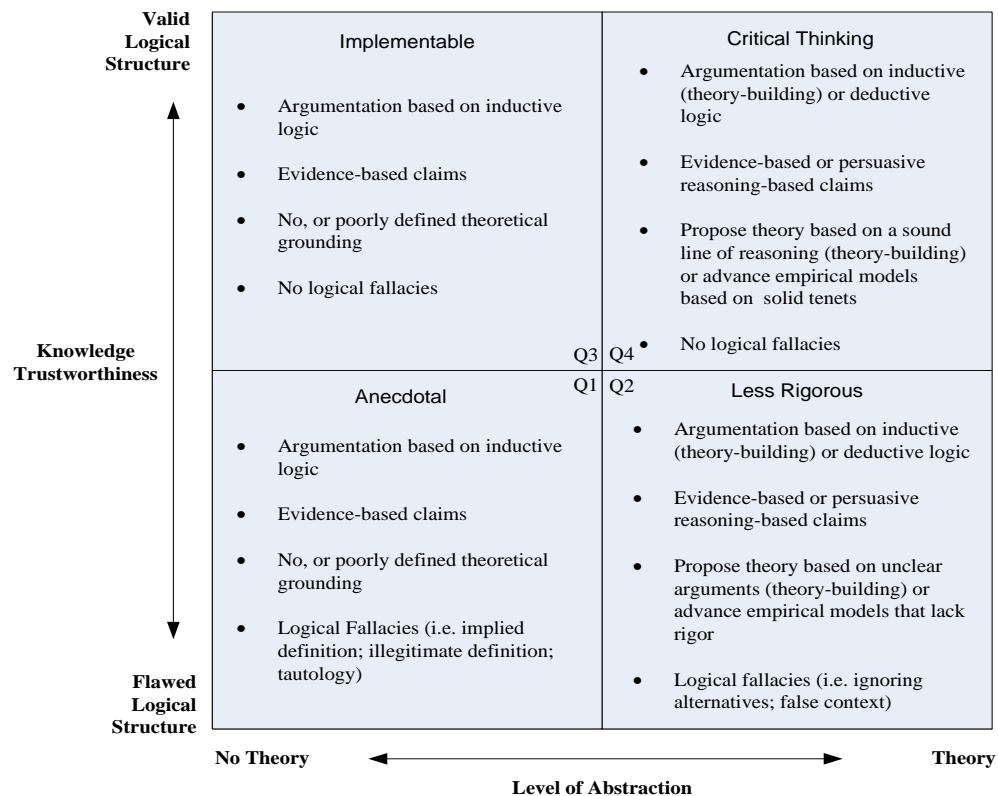
	Valid Logical Structure	
	Implementable	**Critical Thinking**
	• Argumentation based on inductive logic	• Argumentation based on inductive (theory-building) or deductive logic
	• Evidence-based claims	• Evidence-based or persuasive reasoning-based claims
	• No, or poorly defined theoretical grounding	• Propose theory based on a sound line of reasoning (theory-building) or advance empirical models based on solid tenets
Knowledge Trustworthiness	• No logical fallacies	• No logical fallacies
	Anecdotal (Q3 / Q4)	**Less Rigorous** (Q1 / Q2)
	• Argumentation based on inductive logic	• Argumentation based on inductive (theory-building) or deductive logic
	• Evidence-based claims	• Evidence-based or persuasive reasoning-based claims
	• No, or poorly defined theoretical grounding	• Propose theory based on unclear arguments (theory-building) or advance empirical models that lack rigor
	• Logical Fallacies (i.e. implied definition; illegitimate definition; tautology)	• Logical fallacies (i.e. ignoring alternatives; false context)
Flawed Logical Structure		
	No Theory ◄——— **Level of Abstraction** ———► **Theory**	

Figure 1   Typology of knowledge relevancy

Nature of the IS/IT phenomenon studied – From our analysis of the 18 IS/IT integration articles, two themes coalesced:

Theme 1: Post-merger IT Integration Strategies and Outcomes **-**IT integration is assumed to be an antecedent of the merger outcomes; focus is on identifying/measuring IT integration success factors, assessing related decisional issues, and providing contingency frameworks.

Theme 2: Relationship between Post-merger IT Integration and Business Integration **-** Articles that study if and how the processes of post–merger IT integration and business integration are interdependent. Table 1 synthesizes the results.

Table 1 Literature on Post-merger IT Integration

	Variance Models		Process Models	
	T1: Post-merger IT integration strategies and outcomes	*T2: Relationship between Post-merger IT Integration and Business Integration*	*T1: Post-merger IT integration strategies and outcomes*	*T2: Relationship between Post-merger IT Integration and Business Integration*
	Source (conceptual or empirical/knowledge relevancy quadrant)			
Strategic School	Main & Short (1989) (empirical/Q3)	Buck-Lew et al. (1992) (empirical/Q3)		
Organization School	Alaranta and Viljanen (2004) (conceptual/Q3) Huang and Chuang (2007) (empirical/Q4)	Weber and Pliskin (1996) (empirical/Q4)		
Process School	Alaranta (2005) (empirical/Q3) Brown & Renwick (1996) (empirical/Q4) Giacomazzi et al (1997) (empirical/Q4) Hwang (2004) (conceptual/Q3) Johnston & Yetton (1996) (empirical/Q4) Merali & McKiernan (1993) (empirical/Q3) Robbins & Stylianou (1999) (empirical/Q4) Stylianou et al. (1996) (empirical/Q4) Wijnhoven et al. (2006) (empirical/Q4)	Brown et al. (2003) (empirical/Q3) McKiernan and Merali (1995) (empirical/Q3)	Granlund (2003) (empirical/Q4) Mehta & Hirschheim (2004) (empirical/Q4)	

Theme 1: Post-merger IT Integration Strategies and Outcomes

Fully 14 of the 18 articles fell under this theme. These studies were aimed at: (1) identifying/measuring IT integration success factors, (2) assessing decision-making issues, (3) analyzing human resources integration challenges, or (4) emphasizing the importance of the level of IT integration in adopting different organizational integration strategies. Factors such as IS participation in merger planning, level of IS standardization, programming language incompatibilities (Stylianou et al. 1996; Robbins and Stylianou 1999), IS personnel retention (Hwang 2004), resistance to change, cultural readiness, and learning capacity (Alaranta 2005) have been empirically found to have an impact on the results of the process of IT integration. In their longitudinal study, Main and Short (1989), stress the importance of planning the post-merger IT integration, without however, revealing the outcomes. Decision-making are studied at the organization level of analysis by providing process models that enhance our understanding of relationships between design decisions, implementation activities and IT integration outcomes (Mehta and Hirschheim 2004; Granlund 2003). Human resource integration issues are addressed by assessing the impact of the merger on individuals' acceptance of new IT (Huang and Chuang 2007) or by identifying the factors affecting post-merger integration of IS personnel (Alaranta and Viljanen 2004).

Some authors emphasize the importance of the concept of level of IT integration. In the literature on mergers it has been argued that realized synergy is greater than the sum of its parts (Hitt et al. 2001). One measure to assess the outcomes of the interdependencies of the involved organizational structures in a merger is the level of integration, which can be defined as the degree of post-merger change in organizational structures (Pablo 1994). Even though we couldn't find a formal definition, based on Wijnhoven et al.'s (2006) argumentation, the level of IT integration reflects "the level of strategic interdependence and organizational autonomy that the merging firm aims at" (p.8). In theory, high levels of integration should result in the realization of positive IT interdependency-based synergies (Pablo 1994). However, based on Javidan et al.'s (2004) assertion that high levels of integration may create negative synergies caused by the negative influence of various structural incompatibilities between the two organizations, we can argue that high levels of IT integration may result in adverse technological dichotomies. While IT integration is considered the main antecedent of the value (synergy) creation, the level of IT integration concept has the potential to reveal issues related to the trade-off between positive and negative synergies and to influence decision-makers during the integration design process. In this vein, a number of articles advance contingency frameworks that propose different levels of IT integration according to IS requirements, organizational structure differences, growth objectives (Giacomazzi et al. 1997), type of IS governance (Brown and Renwick 1996), level of strategic importance of the IS function, lines of communication, organizational IS learning (Merali and McKiernan 1993), "fit" within and between the IT configurations of the merged entities (Johnston and Yetton 1996) or IT-business alignment (Wijnhoven et al. 2006). These contingency frameworks were empirically tested and different levels of IT integration were found to be appropriate for different merger synergies.

We observe that the majority of the articles (10 out of 14) are positioned within the Process school of thought. Most of the studies – with the exception of the two articles that present a logical structure of a process model – advance variance models. Finally, there were a slightly higher number of articles that fell in the "implementable" quadrant (Q3) than in the "critical thinking" quadrant (Q4).

Theme 2: Post-merger IT Integration and Business Integration

Research falling under this theme focuses on the interdependence between the two processes of post-merger integration: organizational and/or strategic elements and IT elements. This relationship is analyzed in different ways: by empirically testing how the level of IT integration and organizational culture are related to the level of effectiveness of the merger and the organizational culture impacts the outcomes of IT integration (Weber and Pliskin 1996), by assessing the role of IT during the post-merger business integration (McKiernan and Merali 1995), by emphasizing the importance of planning the post-merger IT integration (Brown et al. 2003), or considering IT as being another dimension, besides organizational and strategic, of the "fit" between the merged organizational forms (Buck-Lew et al. 1992).

Overall, the articles present the relationship between the two processes of integration from a deterministic view by adopting variance models and none advances a process model approach to study how the events unfold over time. In terms of knowledge relevancy, we found an equal number, three, of articles in quadrants Q3 and Q4. We also observe that, contrary to the first theme, the articles spread in an almost equal manner across the three schools of thought.

Discussion and Conclusion

Our review shows that although IT "fit" has been found to be an important dimension of post-merger integration (Buck-Lew et al. 1992) and that IT integration has been found to have an important impact on the outcomes of a merger (McKiernan and Merali 1995), the topic, especially the interrelatedness of the processes of IT and business integration, has received relatively little attention. Some issues are raised and suggestions for future research are proposed.

Issue 1: Relationship between the processes of IT and Business post-merger integration. Our literature review shows that organization research has not paid much attention to the issue of IT integration and that IS research has considered IT independently of its social context, as they appear to conceptualize IT integration as a phenomenon independent from the rest of the post-merger integration process. Also, the four articles that study the interdependence between IT and the business integration process (see Table 1) adopt a deterministic approach where the IT is seen as an object that determines organizational structures. It has been argued, however, that IT is simultaneously a social and a physical artifact (Orlikowski and Barley 2001). From such a perspective, "neither a strictly constructivist nor a strictly materialist stance is adequate for studying technologies in the workplace" (p.149). This emergent perspective (Markus and Robey 1988) holds that organizational and technological change emerges unpredictably from complex social interactions. Adopting such a perspective to study the role of IS/IT integration in the process of post-merger integration would contribute to a better understanding of the phenomenon.

Issue 2: Post-merger knowledge sharing and IT. One of the objectives post-merger integration is to ensure that conditions for cooperation and learning among personnel from the merged organizations are created and decision-making design is based on accurate information (Schweiger and Goulet 2000). The Process school states that post-merger integration is a complex learning process that can be dealt with by organizing merger workshops on the new practices (e.g. Leroy and Ramantsoa 1997). Knowledge transfer between the merged companies is a key factor for successful integration (Hebert et al. 2005). Our literature review reveals that the three schools of thought on post-merger integration, however, do not take into consideration the role of IT during the post-merger learning process; similarly, the IS literature on IT integration does not study the role of IT in the process of cross-boundary coordination practices between the members of the newly merged organizations. Changing employees' mindsets and the integration of two knowledge bases are difficult tasks. Despite the fact that the Organization literature mentions the potential of mergers as a means of gaining access to new knowledge and the importance of its sharing during the post-

integration process, few studies have focused on the factors facilitating knowledge sharing and the tools to assure its efficiency. The literature on knowledge management has stressed the importance of relying on individuals to execute boundary spanning activities (Pawlowski and Robey 2004). In IS literature, boundary spanners are assisted in facilitating the sharing of expertise across intra- or inter-organizational boundaries by IT artifacts that have the role of boundary objects (Levina and Vaast 2005). Drawing on this perspective, IS researchers can enhance the understanding of the role of IT artifacts in the process of knowledge transfer across the boundaries between the communities of practice, which during the post-merger period need to learn how to share their expertise and how to collaborate within the structures of the new organizational form.

Issue 3: Process versus Variance models. Only two of the reviewed studies' logical structure was of a process nature. It has been argued that IT-driven organizational change is a social process (Orlikowski 1996), and that a theory of change is best framed as a process theory than as a variance theory (Mohr 1982). It has been argued, however, that the interaction between IT and humans in an organizational environment, however, cannot be regarded as a one-dimensional, causal relationship (Orlikowski and Baroudi 1991). In the case of a radical change such as a merger, process models can handle more complex causal relationships than variance models can and provide an explanation of how the inputs and outputs are related at different levels of analysis, rather than simply identifying the relationship like the variance models do. Process models that are analyzed with appropriate strategies can be used by IS researchers as complementary to deterministic-type models in terms of the source of otherwise unobservable elements that might increase the internal and external validity of the variance models (Sabherwal and Robey 1995).

Issue 4: Need for composite multi-level theories of change. Our analysis, based on the knowledge relevancy dimension, identified only 10 articles from a total of 18 that present a solid theoretical foundation. These studies, with the exception of Mehta and Hirschheim's (2004), advance mono-lens theories of change. Organizational change, however, is difficult to explain without recourse to several theoretical lenses that are often used separately in analyzing a single process (Lapointe and Rivard 2007). It has been suggested that a composite theory is more appropriate to explain change (Poole and Van de Ven 2004). In this view, the process of change is governed by four different "motors" (life-cycle, teleological, dialectical, and evolutionary), which are generic mechanisms derived via induction from the narrative stories of events of organizational change. A multi-level combination of "motors" will accurately describe the "what", "how" and "why" of organizational change. Researchers should consider using such composite theories of change that include different "motors" that act at different levels of analysis when analyzing post-merger IT integration. For example, we can consider the post-merger IT integration process in an organization from a dual-motor perspective, teleological and dialectical. We assume that change is driven by the actions of individuals, usually managers that try to create a new organizational form. These individuals are usually assumed to be rational as they are perceived in the traditional teleological models of IT adoption. However, a teleological perspective of change at the micro level of analysis oversimplifies or overlooks the period of organizational transition from the old practices to the new ones imposed by new

organizational arrangements and eventually supported by a new technology. A dialectic motor at the organizational level of analysis describes how the divergent goals of individuals produce organizational change. At the same time, because the dialectical process encapsulates teleological forces in opposition, the two motors are coexistent in an interdependent relationship.

Post-merger integration is a journey, not a discreet one-time event (Yu et al. 2005). In this vein, we consider that a cross-disciplinary, processual and multi-level perspective can help IS researchers understand the complex process of post-merger IT integration and its interdependence with the business integration process. However, in adopting this approach, they should rigorously adopt and define out-of-discipline concepts and take into account methodological issues, such as the analysis of the process data, implied by a process theory approach.

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APPENDIX F: Interview Protocol Guidelines and Open-ended Questions

Interviewee: _____   **Date:** _____

Time: Begin: _____   **Case # ...**

End: _____

1. Protocol

- Introduction (5 minutes)

    o   Greetings and background of researcher

    o   Research purpose: I am interested in events of knowledge sharing during an IS development project; I will conduct an interview with open-ended questions (45-50 minutes) with follow-up telephone conversations (if necessary)

    o   Present, explain, and sign (both) consent form (provided by the University Ethical Committee). Notify that the CIO approved the methodology (interviews and access to archival documentation). I will be interviewing employees or former employees of the Teaching Health Centre[13] (THC). However, information from one interview will not be shared with other interviewees.

2. Questions

Note: Questions focus on revealing the history of the ISD projects, knowledge complexity at the boundary, individual capital (symbolic) and its valuation, types of boundary objects used during the ISD process, roles of boundary spanners, differences in IS' functionalities between the initial and the go-live phases of the project.

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[13] - The participant will be notified that the real name of the organization and its location has been concealed

Conceptual Framework Concepts	Questions
Individual Status	• Please tell me about your background (professional and academic), and how you came to be in this position? • What was your role in the previously independent hospital *(if applicable)?* • What was your role in the project?
Planned PMI Approach	• In your opinion, was there a clear link between the initiative to develop and implement this IS and the upper management post-merger integration strategy?
Fields of Practice at the Outset	• At the beginning of the project, were there any differences in work practices and norms between the sites/departments? If yes, were these differences site- or lab-based? • How would you assess these practices – some differences, very different, or can't compare? How many practices would you clearly identify? Describe • Can you describe the position within the department/hospital of the major players involved in the SD process? • How different do you think that each hospital (site) were in terms of organizational culture (values, traditions, organizational identification of each hospital's members)? The same, some differences, very different, can't compare? • Do you feel that these differences had played a role in the process of collaboration (information/knowledge transfer/share) during the ISD project? Please describe a concrete example.
Initial IS design functionality	• What were the objectives of the project? Can you describe the initial (<u>planned</u>) design of the new IS?
Project timeline and salient events (cross-boundary KS practices)	• Tell me about the history (timeline, events) and the nature of the IS development project? Milestones. Other important events.
Complexity of the Knowledge at the boundary	<u>Differences</u> • Were there any challenges/difficulties at the outset of the project due to differences in knowledge on work practices of the other sites? • Were you able to correctly assess these differences at the outset of the project? Or did you discover them during the IS development? • How would you describe the level of differences in knowledge? Low, medium, high? Why? <u>Dependency</u> • Were you dependent on other resources (ex. documents, other employees) to successfully acquire the necessary knowledge to develop the IS?

	• Were you able to correctly assess these dependencies (ex. persons that would be knowledgeable about the system)?
	Novelty
	• How would you describe the level of novelty of the context (team members, system functionality, Organizational / departmental context)?
	• Have you (and the others for that matter) ever been involved in developing a similar application?
	Negative consequences
	• Did you feel at outset that negative consequences related to the development of the new system (ex. political pressure, work-related) will arise?
Boundary objects	• During your efforts to develop the system, what kind of tools and/or techniques you and your colleagues use to represent the design of the application (ex. Technical documents, screen snapshots, product prototypes, screen mockups, undocumented standards built on consensus etc.)?
	• What were the means for collaborating (information/knowledge transfer/share) with the other team members during the ISD process (ex. Documentation, e-mail, etc.)?
Final IS Functionality	• In your opinion, how different was the functionality of the final version of the system from the initial (planned) design?
Fields of Practice at the Outcome	• Once the IS was implemented, did the work practices of the users of the new IS change? If yes, how different were they at the end of the implementation (or now) from how they were at the outset of the implementation of the IS?
	• How would you describe the change in these practices today: it was marginal or it touched the core of the practices?
Individual capital	• Did you find that there were other team members that you find them influential during the ISD due to their expertise, knowledge, or status within the organization? Which ones?
	• What was the main benefit of having these individuals as members of the team for the ISD outcomes?
	• Why do you think that their input was valuable?
Role and actions of the boundary spanners	• Would you call yourself a boundary spanner? (definition - *enables/promotes/control communication and collaboration across boundaries between groups/practices/departments/sites*) If yes, what were your actions as boundary spanner?
	• Decisions regarding the design of the system were taken during the development process – do you think that these decisions were influenced by some of the team members (ex. Nurses)?
	• Did any of the team members try to influence the way the system was designed? If yes, do you think that this

| | was due to their prior experience in the domain, their knowledge, or the fact that they were reflecting the needs/interests of the community that they were representing? |
| | • Can you think of an incident when you and the rest of the project stakeholders did not agree about the functionality of the system? How often did this happen? Did you try to convince the others of your decision? How? If not, why not? |

APPENDIX G: Codification Scheme – Concepts, Elements and their Characteristics

Concept	Element	Characteristics	Code
Link between the PMI approach and the new IS	Communication	Existence of top management communication plan at all levels across all merged parties (making clear critical issues regarding the merger and necessity for integrating information technologies)	COMM
Knowledge Sharing (KS) process	Translation	Some differences and dependencies are unclear or some meanings ambiguous; the process of KS must deal with interpretive differences by creating shared meaning	KS-TL
	Transformation	Agents have different interests; KS requires agents to alter part of their existing knowledge as they engage in a process of negotiation and knowledge transformation	KS-TR
Fields of practices	Emergence of different fields of practice	Merging parties, be they entire organizations, business units or business processes in which individuals who share unique sets of practices are in pursuit of a joint interest	C-FP
Complexity of Knowledge at the boundary	Differences in knowledge at the boundary	Difference in amount of knowledge accumulated within each field of practice involved in knowledge sharing.	C-DIFF
	Dependencies at the boundary	The extent to which the agents must pay attention to each other so as to meet their goals	C-DEP
	Degree of novelty at the boundary	A high degree of novelty involves a lack of common knowledge to adequately share and assess domain-specific knowledge at a boundary	C-NOV
	Potential Negative consequences	Negative consequences can arise from the differences and dependencies at the boundary	C-NC
Boundary Objects	Email	Provide concrete means for agents to learn about their differences and dependencies	BO-EMAIL
	Unstructured documentation		BO-UD
	Structured documentation		BO-SD
	Screen shots (mock-ups)	Accommodate a process where agents jointly transform their knowledge	BO-SS
	Prototypes		BO-PROT
IS Functionality	Initial Scope	Reflects the practices, norms and values promoted by a specific PMI integration approach	ISF-I
	Final functionality	Different functionalities than the ones defined in the initial design; may reflect a different PMI integration approach	ISF-F

Practices	Pre-ISD	Coordinated activities of individuals and groups in doing their work as it is informed by a particular organizational or group context prior of the implementation of the IS	P-PRE
	Post-ISD	Coordinated activities of individuals and groups in doing their work as it is informed by a particular organizational or group context after the implementation of the IS	P-POST
Symbolic Capital	Process of valuation of capitals	Validation of claims of authoritative knowledge; attribution of legitimacy	SC-VAL
Role of Boundary Spanners	Claims of authoritative knowledge	Ways of knowing that are useful for justifying actions by agents engaged in the process of KS	BSR-AK
	Try to influence	Use their symbolic capital to claim "authoritative knowledge"	BSR-INFL
	Acts as a leader	Mitigates agents' status differences to establish effective knowledge sharing or to legitimize their knowledge base	BSR-L
Group-making	Symbolic discourses	"Class" or "group" exists when there are agents capable of imposing themselves, are authorized to speak and to act officially in its name and who are recognized by the other members of the group as being endowed with full power to speak and act in their name	GM
Objective Complicity	Organizational identity	Existence of a shared set of values, norms, and practices, which are constitutive elements of the field "sameness".	OB-C