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ENTERPRISE RESOURCE PLANNING POST-IMPLEMENTATION ASSIMILATION CHALLENGE:
An Integrative Framework for a Better Post-Implementation Assimilation

Thèse présentée
à la Faculté des études supérieures de l'Université Laval
dans le cadre du programme de doctorat en sciences de l'administration
pour l'obtention du grade de Philosophiae Doctor (Ph.D.)

FACULTÉ DES SCIENCES DE L'ADMINISTRATION
UNIVERSITÉ LAVAL
QUÉBEC

2009

Abstract

The present study subscribes in the emerging post-implementation IT research and aims to contribute to the ongoing discussion of the impact of contextual factors on the level of assimilation of complex technologies such as ERP systems. Given the dearth of research on ERP experience in developing countries, the present study purports to enrich this much neglected field by mainly considering ERP initiatives of firms in a developed and a developing country. Since an IT business value could be realized only when the system is deeply assimilated in the organization, this research investigates the factors that lead to varying ERP assimilation levels among firms despite their use of a similar basic technology.

Based on a qualitative research methodology using the multiple case study approach, we explore the determinants of an effective ERP assimilation and its subsequent challenges. Furthermore, we develop an integrative model that describes the relationships between the identified factors. The data analysis revealed a set of organizational, technological and environmental factors which have a direct or an indirect impact on ERP assimilation. This is mainly true of the top management support, their strategies, interventions, and perceptions, all of which have turned to be the underlying factor shaping, directly or indirectly, the assimilation process in an organization. In the same vein, differences between the two groups of firms in the two countries are related more to their organizational contexts than to cultural differences. These findings are common across the studied companies in both contexts. Based on the analysis results, an integrative framework is suggested in order to delineate the relationships between the identified factors. All in all, the present study provides a structured road-map for understanding ERP assimilation and highlights several critical issues and crucial determinants which should be carefully managed and thoroughly considered in order to achieve high ERP business value.

Key words:

Enterprise resource planning; ERP systems; assimilation; post-implementation; case study; developing country; manufacturing companies.

Résumé

Cette étude s'inscrit dans la recherche émergente sur la post-implémentation des TI et vise à contribuer à la discussion sur l'impact des facteurs contextuels sur le niveau d'assimilation des technologies complexes telles que les systèmes ERP. Compte tenu de la rareté des recherches, cette étude vise aussi à enrichir ce champ de recherche qui a été considérablement négligé lors de l'examen des initiatives d'ERP d'entreprises dans un pays en développement. Comme la plus-value d'une TI ne peut être réalisée que lorsque le système est véritablement assimilé dans l'organisation, cette recherche examine les facteurs qui entraînent des niveaux d'assimilation variés entre les entreprises malgré leur utilisation d'une technologie de base similaire.

En adoptant une méthodologie de recherche qualitative recourant à une approche de cas multiples, on explore les déterminants de l'assimilation efficace de l'ERP et ses défis ultérieurs. En outre, on développe un modèle intégrateur qui décrit les relations entre les facteurs identités. L'analyse des données a révélé un ensemble de facteurs organisationnels, technologiques et environnementaux ayant un impact direct et indirect sur l'assimilation de l'ERP. Cela est surtout vrai pour le soutien de la haute direction, ses stratégies, ses interventions et ses perceptions, qui se sont avérés les facteurs sous-jacents influant directement et indirectement sur le processus d'assimilation dans une entreprise. De même, les différences entre les deux groupes d'entreprises sont liées plus à leur contexte organisationnel qu'aux différences culturelles. Ces résultats sont communs pour toutes les entreprises étudiées dans les deux contextes. Fondé sur les résultats de l'analyse, un modèle intégrateur est suggéré dans le but de décrire les relations entre les différents facteurs. Ainsi, cette étude offre une feuille de route structurée pour mieux comprendre l'assimilation et met en relief plusieurs problèmes critiques et des déterminants cruciaux qui devraient être attentivement gérés et minutieusement considérés afin de réaliser une valeur ajoutée importante de l'ERP.

Mots clés:
Progiciel de gestion intégré, systèmes ERP, assimilation; post-implémentation; étude de cas, pays en développement, entreprises manufacturières.

Foreword

The present dissertation is manuscript-based and includes three related articles which make a cohesive research report that contributes to filling the gaps in the post-implementation assimilation process, its determinants and its challenges. I am the primary author of these three articles which are jointly authored with my supervisor, Dr. Diane Poulin, and my co-supervisor, Dr. Robert Pellerin. As a main author, I contributed to each article by consulting the relevant literature, preparing the research design, realizing the empirical work, data collection and analysis and writing the papers. The co-authors provided valuable comments and suggestions for each of the three papers.

The three articles are inserted in the thesis manuscript as chapters 3, 4 and 5. The first article is inserted as published in the Journal of Operations and Logistics. The second article is also inserted in its final format that was accepted for publishing in the International Journal of Business Information Systems. Finally, the third article is inserted as the version that was submitted to the Journal in Global Information Technology Management.

References of these articles are as follows:

- **Article 1:**

  Kouki, R, Poulin, D. and Pellerin, R. (2007). ERP Assimilation Challenge: An Integrative Framework for a Better Post-Implementation Assimilation. *Journal of Operations and Logistics*, 1 (3), V1-V16.

- **Article 2:**

  Kouki, R, Pellerin, R et Poulin, D. (2010). Investigating the Determinants of Effective Enterprise Resource Planning Assimilation: A Cross-Case Analysis. *International Journal of Business Information Systems*, 5(1).

- **Article 3:**

  Kouki, R, Poulin, D and Pellerin, R. Determining Factors of ERP Assimilation: Exploratory Findings from a Developed and a Developing Country. *Submitted to the Journal in Global Information Technology Management.*

Note on the included articles

It is important to acknowledge that some sections of the articles, especially the theoretical ones, are somewhat similar. The fact of the matter is that these sections were included for a number of reasons, not least because they highlight the thread connecting the three articles to make a unified study. Secondly, we included these similar sections after the strong recommendations of the reviewers of the journals who suggested that we provide more detailed descriptions of the cases and of the selected variables. This is in addition to the methodology and the assimilation concept.

Abstracts of the inserted articles

Article 1

Title

ERP Assimilation Challenge: An Integrative Framework for a Better Post-Implementation Assimilation

Abstract

Nowadays, an organization's survival does not only hinge on its aptitude of being both reactive and innovative but also, and mainly, on its potential to ensure both an effective and an efficient management of its value added network. This and other business pressures have led to the development of ERP systems. ERP adoption projects are, however, fraught with challenges and complexities. A research model for identifying and understanding the most influential factors on ERP assimilation has been developed based on the diffusion and assimilation of complex technologies literature and on ERP projects implementation literature.

Key words: Enterprise integration and management; enterprise resource planning, assimilation; complex technologies; information technology for supply chain management.

Article 2

Title

Investigating the Determinants of Effective Enterprise Resource Planning Assimilation: A Cross-Case Analysis

Abstract

ERP systems have long been known for their significant impact on the adopting companies, irrespective of size and industry. Prior ERP research has mostly focused on the selection, evaluation and implementation stages. However, the high failure rates of ERP projects, even after a successful system installation, indicate that the post-implementation stage is very critical for the success of ERP projects. Based on a qualitative research methodology using the multiple case study approach, this article investigates the determinants of ERP assimilation success during the post-implementation stage of three Canadian manufacturing companies.

Key Words: Enterprise resource planning; ERP systems; assimilation; post-implementation; case study; manufacturing organizations.

Article 3

Title

The impact of contextual factors on ERP assimilation: Exploratory Findings from a Developed and a Developing Country

Abstract

ERP systems gained a worldwide popularity as the software application that would improve the businesses' efficiency and productivity and streamline their operations. Realizing these benefits however depends on the deep and extensive assimilation of the system in the organization. Research about ERP post-implementation and ERP assimilation however is very limited. Similarly, scant research investigated ERP experiences in developing countries. Based on a qualitative research methodology grounded in the diffusion of innovations theory, the present study aims at investigating the contextual factors that would promote ERP assimilation. A cross-case study analysis of six firms in a developed and a developing country suggest that in both contexts, the primary factor for encouraging a successful ERP assimilation is top management support. Other factors such as post-implementation training and education, IT support, organizational culture, managers and users involvement, strategic alignment, cultural differences, external pressures and consultant effectiveness were also identified as factors that influence ERP assimilation. Our results also emphasize the need to watch for and to carefully manage factors that could hamper the proper ERP assimilation.

Key Words: Enterprise resource planning; ERP systems; assimilation; post-implementation; case study; developing country; manufacturing organizations.

Résumés des articles insérés

Article 1

Titre

Les défis de l'assimilation: un modèle intégrateur pour une meilleure assimilation post-implémentation.

Résumé

De nos jours, la survie d'une organisation ne dépend pas seulement de ses aptitudes à être réactive et innovatrice, mais aussi, et principalement, de son potentiel d'assurer une gestion à la fois efficace et efficiente de son réseau à valeur ajoutée. De telles pressions ont entraîné le développement des systèmes ERP. Toutefois, les projets d'adoption d'ERP posent beaucoup de problèmes et de complexités. Fondé sur la documentation portant sur la diffusion et l'assimilation des technologies complexes et l'implémentation des ERP, un modèle de recherche a été développé dans le but d'identifier et de comprendre les facteurs les plus influents de l'assimilation de l'ERP.

Mots clés: Intégration et gestion de l'entreprise; progiciel de gestion intégré; assimilation; technologies complexes; technologie de l'information pour la gestion de la chaîne logistique.

Article 2

Titre

Examen des déterminants d'une assimilation efficace des progiciels de gestion intégrés: une analyse comparative

Résumé

Les systèmes ERP sont connus pour leur impact significatif sur les entreprises adoptantes, indépendamment de leur taille ou de l'industrie. La plupart des recherches antérieures sur les ERP ont porté sur les phases de sélection, d'évaluation et d'implémentation. Toutefois, les taux d'échec élevés des projets ERP, même après une installation réussie du système, indiquent que la phase post-implémentation est très critique pour le succès des projets ERP. Sur la base d'une méthodologie de recherche qualitative recourant à l'approche de cas multiples, cet article examine les déterminants de succès de l'assimilation de l'ERP durant la phase post-implémentation de trois entreprises manufacturières canadiennes.

Mots clés: enterprise resource planning; ERP systems; assimilation; post-implementation; case study; manufacturing organizations.

Article 3

Titre

L'impact des facteurs contextuels sur l'assimilation d'ERP: résultats exploratoires d'un pays développé et d'un pays en développement.

Résumé

Les systèmes ERP ont acquis une popularité mondiale comme logiciel d'application qui pourrait améliorer l'efficience et la productivité des entreprises et rationaliser leurs opérations. Toutefois, la réalisation de ces avantages dépend de l'assimilation profonde et étendue du système dans l'entreprise. Cependant, les recherches sur la phase post-implémentation et sur l'assimilation de l'ERP sont très limitées. De même, les recherches examinant les expériences en ERP des pays en développement sont très rares. Sur la base d'une méthodologie de recherche qualitative fondée sur la théorie de l'innovation, cette étude vise à examiner les facteurs contextuels qui pourraient promouvoir l'assimilation de l'ERP. Une étude comparative de six entreprises dans un pays développé et un pays en développement suggère que dans les deux contextes, le facteur principal d'une assimilation réussie est le support de la haute direction. D'autres facteurs, tels que la formation et l'éducation post-implémentation, le support du département de TI, la culture organisationnelle, l'implication des gestionnaires et des utilisateurs, l'alignement stratégique, les différences culturelles, les pressions externes et l'efficacité du consultant ont aussi été identifiés comme ayant une influence sur l'assimilation de l'ERP. De même, nos résultats mettent en valeur le besoin de surveiller et de gérer minutieusement des facteurs qui pourraient entraver la bonne assimilation de l'ERP.

Mots clés: Progiciel de gestion intégré; systèmes ERP; assimilation; post-implémentation; étude de cas; pays en développement; organisations manufacturières.

Acknowledgements - Remerciements

A l'issue de cette thèse, c'est avec un grand plaisir que je profite de cette section pour remercier celles et ceux qui ont été associés de loin ou de près à ma vie de doctorante.

En tout premier lieu, je tiens à exprimer mes sincères remerciements et ma profonde gratitude envers ma directrice de thèse Dr. Diane Poulin, Professeure à l'université Laval. Je tiens à la remercier pour la qualité de son encadrement. Sa manière de travail, organisée, rigoureuse et constructive, que j'ai beaucoup appréciée, et son expérience m'ont été d'un grand profit. Je lui témoigne ma gratitude pour ses confortations aux moments les plus difficiles et pour sa patience envers mes lacunes. Je tiens également à la remercier pour être toujours disponible malgré ses nombreuses fonctions.

Je tiens également à remercier grandement mon co-directeur de thèse Dr. Robert Pellerin, Professeur à l'École Polytechnique de Montréal pour avoir participé à ma formation. Je tiens tout particulièrement à le remercier pour son enthousiasme, ses conseils et ses encouragements prodigués tout au long de ce travail de recherche. Son regard critique a été souvent très bénéfique pour améliorer ce travail. Malgré la distance, il était toujours disponible pour des discussions rationnelles et il a su me faire profiter de son expertise dans le domaine des ERP et me transmettre ses valeurs qui m'ont nettement servi à développer ma curiosité et mon esprit critique.

Tout deux m'ont donné le goût de la recherche et sans eux cette thèse n'aurait jamais abouti. Je tiens aussi à leur exprimer ma reconnaissance pour avoir été compréhensifs envers mes choix personnels.

J'exprime ma gratitude à Dr. Jean-Marc Frayret, de l' l'École Polytechnique de Montréal, Dr. Sehl Mellouli de l'Université Laval et Dr. Fouad Riane, de l'Université Catholique de Louvain, pour avoir accepté d'être membres de mon jury et pour l'honneur qu'ils me font pour évaluer mes travaux.

Je tiens également à témoigner ma grande reconnaissance au Consortium de recherche For@c et en particulier à Dr. Sophie d'Amours, la directrice du Consortium, pour avoir financé ma recherche. Ma gratitude s'adresse, au CIRRELT', ex-Centor, pour les conditions logistiques excellentes qui m'ont été fournies pour que je réalise ma recherche. Mes remerciements vont aussi à Louise Doyon qui était toujours disponible pour m'offrir de l'aide.

J'aimerais aussi remercier toutes les personnes que je nomme «ressources» dans ma thèse qui m'ont ouvert les portes pour que je réalise mes entrevues. Je remercie aussi tous les répondants, qui ont participé à cette recherche, pour le temps qu'ils m'ont alloué pour que je réalise les entrevues et pour avoir partagé leur expérience ERP. Sans eux, je n'aurais pu réaliser la partie empirique de cette recherche.

Mes remerciements vont également au personnel du programme de doctorat en sciences de l'administration, en particulier à Mme Marie Claude Beaulieu, la directrice du programme pour sa confiance et sa compréhension et à Mme Johanne Nadeau pour son aide et sa disponibilité.

Je tiens aussi à remercier très sincèrement deux personnes qui étaient de grande assistance pour que j'avance dans mes travaux: ma sœur-amie Chiraz Saidani, qui par sa compétence en recherche qualitative et par son regard de néophyte sur le thème de ma recherche m'a aidé à affiner mes

propos et m'a assisté à bien mener la recherche empirique; mon frère et collaborateur Haythem Kouki, qui m'a alloué (gratuitement) une grande partie de son temps malgré ses occupations pour m'assister à faire les entrevues. Par son expertise dans le domaine et son esprit curieux, il a pu toujours enrichir nos discussions avec les répondants.

Je vous serai toujours reconnaissante pour tout cela ainsi que pour m'avoir toujours soutenu, encouragé, écouté et motivé.

Un grand merci aussi à Alia Alatassi, Hager Khechine, Saida Harguem, Connie Van-Horne, Rania Thabet, Souad Hanani, Fatima-Zahra Barrane, Yao Amewokunu, ainsi qu'à tous ceux qui m'ont assisté et soutenu tout au long de cette thèse. Ma reconnaissance va aussi à ma chère Hanaa Walzer qui, malgré la distance, a toujours su me soutenir, m'encourager et me remonter le moral dans les moments de découragement.

Je ne saurai trouver les mots pour traduire ma gratitude, ma reconnaissance et mon affection à mes très chers parents, Abdelmajid et Zeineb, source d'amour inconditionnel, d'encouragement et d'espoir. Je vous remercie pour vos sacrifices, pour la confiance que vous m'avez toujours accordée et surtout pour votre immense patience. J'ai toujours voulu que vous soyez fiers de votre fille, j'espère réussir mon pari.

Ma reconnaissance et ma gratitude vont aussi à mes très chères sœurs Feten et Sonia pour leur soutien inébranlable, leurs encouragements et leurs prières. Je vous serai toujours très reconnaissante pour tout cela et surtout pour votre aide précieuse durant mon séjour de recherche en Tunisie, pour que je réalise mon étude dans les meilleures conditions.

Enfin, mes plus sincères remerciements vont à mon cher époux Nizar pour le temps (les heures!) qu'il a passé à lire (et relire!) mon travail et à corriger les fautes d'anglais, souvent très agaçantes, d'une doctorante essoufflée. Je le remercie également pour sa grande patience, sa compréhension, son affection et son soutien inestimable pour que je puisse mener à terme ce projet.

À mes parents Abdelmajid et Zeineb,
À Nizar,
À Feten, Sonia et Haythem,
À Aicha et Jaafar

Table of Contents

Abstract ii

Résumé iii

Foreword iv

Note on the included articles v

Abstracts of the inserted articles vi

Résumés des articles insérés ix

Acknowledgements - Remerciements xii

Table of Contents xv

List of Tables xix

List of Figures xx

Introductory Chapter 1

1.1. Research Objectives 6

1.2. Structure of the Thesis 9

CHAPTER 2 – Methodology 11

2.1. Introduction 11

2.2. Philosophical perspectives: IS research schools of thought 12

2.3. Research method 14

2.4. Data collection 16

2.4.1. Pilot Study 16

2.4.2. Sampling: Selection of cases 17

2.4.3. Accessing the nominated cases 18

2.4.4. Participants 20

2.4.5. Data collection procedures 22

2.4.6. Measures of confidentiality 23

2.5. Case study analytic strategy 24

2.5.1. Within-case analysis 25

2.5.2. Cross–case analysis 26

2.6. Research validity and reliability 26

2.6.1. Reliability (Dependability) 27

2.6.2. Construct validity (Confirmability) 27

2.6.3. Internal validity (Credibility) 28

2.6.4. External validity (Transferability) 28

CHAPTER 3 - ERP Assimilation Challenge: An Integrative Framework for a Better Post-Implementation Assimilation 33
3.1. Introduction 33
3.2. ERP Systems Challenges: Impediments to Assimilation 36
3.3. The Concept of Assimilation 39
3.3.1. Assimilation of Complex Technologies 41
3.4. ERP Post-Implementation and Assimilation Previous Works 44
3.5. ERP Assimilation Context: TOE Framework 46
3.5.1. Technological Context 47
3.5.1.1. ERP Attributes 48
3.5.1.2. IT Expertise 49
3.5.2. Organizational Context 49
3.5.2.1. Top Management Championship 49
3.5.2.2. Absorptive Capacity 50
3.5.2.3. Strategic Alignment 51
3.5.2.4. User Involvement 52
3.5.2.5. Reward System 53
3.5.3. Environmental Context 53
3.5.3.1. Institutional Pressures 53
3.5.3.2. Consultants Effectiveness 55
3.5.3.3. Vendor Support 56
3.6. ERP Benefits 57
3.7. Conclusion 57

CHAPTER 4 – Investigating the Determinants of Effective Enterprise Planning Assimilation: A Cross-Case Analysis 59
4.1. Introduction 59
4.2. The Concept of Assimilation 61
4.3. Research Framework 62
4.4. Technological context factors 63
4.4.1. ERP attributes 63
4.4.2. IT expertise 64
4.5. Organizational context factors 64
4.5.1. Top management support 64
4.5.2. Strategic alignment 65
4.5.3. User involvement 65
4.5.4. Absorptive capacity 66
4.5.5. Reward system 66
4.6. Environmental context factors 67
4.6.1. Institutional pressures 67
4.6.2. Vendor support 67
4.6.3. Consultant effectiveness 68
4.7. Research Methodology 68
4.8. Case analysis 70
4.8.1 Company A 74
4.8.1.1. Implementation stage 74

4.8.1.2. Post-implementation stage 75
4.8.2. Company B 77
4.8.2.1. Implementation stage 78
4.8.2.2. Post-implementation stage 78
4.8.3. Company C 80
4.8.3.1. Implementation stage 81
4.8.3.2 Post-implementation stage 81
4.9. Discussion 87
4.9.1. ERP attributes 87
4.9.2. Top management support 88
4.9.3. Level of IT expertise 89
4.9.4. Absorptive capacity 89
4.9.5. User involvement/Manager involvement 90
4.9.6. External factors 91
4.9.7. Prevailing organisational culture 91
4.10. Conclusion 92

CHAPTER 5 – The Impact of Contextual Factors on ERP assimilation: Exploratory findings from a Developed and a Developing Country 94
5.1. Introduction 94
5.2. Theoretical foundation 97
5.3. Research framework 100
5.4. Methodology 101
5.5. Brief company backgrounds 104
5.5.1. Canadian companies 104
5.5.1.1. Company A 104
5.5.1.2. Company B 104
5.5.1.3. Company C 105
5.5.2. Tunisian companies 105
5.5.2.1. Company D 105
5.5.2.2. Company E 106
5.2.2.3. Company F 106
5.6. Case Analysis 110
5.6.1. Technological context 110
5.6.1.1. ERP attributes 110
5.6.1.2. IT/ERP Expertise 111
5.6.2. Organizational context 113
5.6.2.1. Top management support 113
5.6.2.2. Strategic alignment 114
5.6.2.3. User involvement 116
5.6.2.4. Absorptive capacity 119
5.6.2.5. Compensation/reward system 121
5.6.3. Environmental context 122
5.6.3.1. Institutional pressures 122
5.6.3.2. Vendor support 123
5.6.3.3. Consultant effectiveness 124

5.7. Evaluation of assimilation in the studied organizations 125
5.8. Discussion 134
5.8.1. What determinants could explain the variation in ERP assimilation among firms? 134
5.8.2. What are the differences between the two groups of firms? 140
5.9. Conclusion 146

Conclusion 149
6.1. Overview of main findings 149
6.2. Contributions 154
6.2.1. Theoretical contributions 154
6.2.2. Contributions to practitioners 156
6.3. Limitations 156
6.4. Future research 157

References 160

APPENDICES 175
Appendix 1- The Email Sent to the Key Persons in the Participating Companies 176
Appendix 2- Interview Guide 178
Appendix 3- Consent Form 182

List of Tables

Table 2-1 Interviewed Informants for Each Case 21
Table 2-2 Validity and Reliability Measures 30
Table 4-1 Company A, Company B and Company C Profiles 71
Table 4-2 Summary of Findings 84
Table 5-1 Validity and Reliability measures 103
Table 5-2 Profiles of Companies A, B, C, D, E and F 108
Table 5-3 Summary of Findings 129

List of Figures

Figure 2-1 Research Methodology 32
Figure 3-1 ERP Assimilation Process in Relation to the Other Processes 41
Figure 3-2 ERP Assimilation Framework 47
Figure 4-1 Research Framework 63
Figure 5-1 Research Framework Adapted from Kouki et al., 2007; 2010 100
Figure 5-2 An Integrative Framework for ERP Assimilation 145

Introductory Chapter

For organizations, and due to its paramount significance, sustainable competitive advantage has almost been an unremittingly sought-for objective. In an intensive knowledge economy, in which high quality and timely information is a requirement, it has become incumbent on organizations more than ever, not only to be reactive and innovative, but also to be able to manage effectively and efficiently its value added network. Furthermore, with the expanding and highly dynamic borderless world market, organizations are exposed to new types of markets, customers and competitors. As a consequence, decision makers face the challenge and the requirements of high levels of effectiveness, flexibility, quality, speed, and reliability of delivery.

Managers have been more and more alert to the indispensability of enterprisewide integration, business process improvement, reliable and timely data transfer within and outside the organization. Moreover, with the advent of internet technologies and online shopping, businesses need an integrative structure which would help them close the loop between back-office and front-office processes, from order execution to order fulfillment (Hayman, 2000). All these business pressures, and others, led to the emergence of the enterprise resource planning (ERP) systems.

An ERP system is a complex packaged business solution that is designed to automate and integrate business processes in real time environment (Markus and Tanis, 2000). It shares common data and practices across the enterprise and provides access to information in a real time environment (Hawking et al., 2004). According to Davenport (1998, p. 123), ERP systems are intended to be a "single comprehensive and integrated data-base which

collects data from and feeds data into modular applications supporting virtually all of a company's business activities – across functions, across business units, across the world."

Tempted by the numerous advantages and promises of ERP systems, businesses worldwide have extensively invested in these information technology (IT) applications. In fact, by reflecting the best practices in industry that enable intra-organizational and inter-organizational transparency and real time information exchange, ERP systems attempt to meet a firm's various operational, tactical and strategic needs (Gupta and Kohli, 2006). In essence, the system is designed to improve the operational efficiency and business effectiveness by providing seamless business process integration, higher interoperability between the organization's systems, better workflow between business functions, standardized business practices and higher connectivity (Chou and Chang, 2008; Gupta and Kohli, 2006; Jacobs and Bendoly, 2003).

With the growing importance of global value chains and the increase in possibilities offered by the constantly evolving internet and electronic commerce technologies, ERP systems have become a vital platform for firms which focus on improving their inter-functional, inter-site operations as well as integrating and improving the quality of communication and information exchange within their network of suppliers, distributors and their international collaborative operations (Yu, 2005; Gupta and Kohli, 2006). With all these benefits, ERP systems could be seen as valuable competitive assets especially when integration cuts across boundaries to reach the firm's extended supply chain partners therefore creating a seamless and integrated "value chain" (Lengnick-Hall et al., 2004; Al-Mudimigh et al., 2001).

In spite of their promising benefits, ERP projects have proved to be very challenging and their failure could be not only risky but even fatal (Davenport, 1998). Such was the

case of many organizations where "the golden dream turned into a nightmare" (Wood and Caldas, 2001).

Indeed, difficulties and pitfalls with ERP projects have been widely reported in the literature which somewhat littered the picture of ERP systems. In fact, it was confirmed that several projects did not succeed in reaching their objectives thus causing significant financial difficulties and threatening a company's ability to carry out its major objectives. Others failed after a medium-term success (Muscatello and Parente, 2008; Liang et al., 2007; Yu, 2005; Jasperson et al., 2005). This was caused mostly by long term repercussions. Others, however, were terminated before completion. Similarly, in spite of the extensive worldwide ERP systems investments, a small portion of firms managed to deploy effectively their systems and achieve significant value (Kamhawi, 2008; Yu, 2005). For instance, it was estimated in a study that the great majority of the adopted systems were shallowly used with just about 50 to 75 percent of the system functionalities discovered and deployed (Yu, 2005). All these issues and pitfalls were primarily attributed to the complexity of ERP systems and to the resultant strong impact on organizational structures, business processes and even cultures (Kamhawi, 2008; Liang et al., 2007).

Referring to Swanson's (1994) taxonomy of information systems (IS) innovations[1], ERP systems are a type III innovation considered to be the most complex IS innovations category. Because of their enormous impact on a firm's financial performance and competitiveness, Swanson has described type III innovation category as ITs of strategic relevance for the firm. They are integrated with the core business process and strategies and, thus, they potentially affect the whole business. Type III innovations such as ERP systems occur at the enterprisewide level. Their assimilation requires mobilizing a wide group of stakeholders at different organizational levels and their constant interaction. This

[1] Type I innovations are process innovations within the IS function aiming at enhancing the efficiency and effectiveness of the IS function (e.g. relational database, object oriented technologies); Type II innovations refer to IS products and services used to enhance the administrative core of the business (e.g. payroll and personnel record systems)

applies to wide-scope ERP systems that require the involvement of multiple functions, various partners, and a wide range of business areas (Morton and Hu, 2008). As a result, ERP projects outcomes are very dynamic and could hardly be guaranteed. As Liang, Saraf, Hu and Xu (2007) opine, the outcomes of ERP projects are often "a moving target". Interestingly, cases of successful implementation could sometimes result into unused and abandoned system and therefore a failure. Conversely, even though a project could be plagued during implementation with various problems such as schedule delays, excessive costs and technical problems, it could turn into a later success with widely deployed and integrated system. Hence, assuming that the mere availability of an IS would translate into effective system assimilation and realize the system's value is elusive. Similar to other technologies (e.g. Chatterjee et al., 2002; Purvis et al. 2001; Armstrong and Sambamurthy 1999), achieving an ERP's benefits and guarantying its potential business value is contingent upon the extensive and effective assimilation of the system during the post-implementation stage.

After focusing for a long time on the early IT projects stages, it was only recently that diffusion scholars have realized the importance of the post-implementation stage of IT-based innovations and the need to further study this stage. This was done when they have observed that most of the potential benefits of innovations were achieved later during the post-implementation stage (Markus and Tanis, 2000; Cooper and Zmud, 1990; Kelley, 1994). In other words, they are achieved once the system is deeply assimilated in the organization (Chatterjee et al., 2002; Purvis et al. 2001; Armstrong and Sambamurthy 1999; Zmud and Apple 1992).

For ERP systems, it was suggested that the ERP journey comprises two major waves with the go-live marking the border line between both waves (Willis and Willis-Brown, 2002). During the first wave, the necessary ERP tools are selected, adopted and implemented ending by the go-live. In spite of its importance, the go-live milestone should neither be considered as the final goal, nor the end of the journey or of their ERP effort.

Organizations need to understand fully the potential of their systems and to adopt a long term view of their ERP project which would act as a catalyzer to help them overcome early post-implementation issues. Therefore, the post-implementation stage could be seen as the second major wave of the ERP journey where efforts focus on supporting and enabling the organization to maximize the value and return on its ERP investment (Willis and Willis-Brown, 2002). For that reason, ERP post-implementation challenges go beyond system maintenance and troubleshooting; how well the system's potentials and functionalities are deployed in the company and how well the business improves its performance using the system are the main issues that firms are facing today (Jones and Young, 2006; Markus et al., 2000). These issues justify the need to study and investigate this crucial stage in the ERP project life cycle.

In spite of the existence of a rich body of literature on various ERP issues, much of this research concerned package selection, ERP adoption, critical success factors and methodologies of ERP implementation (Ifinedo, 2007; Esteves, 2001; Jacobs and Bendoly, 2003). There has been however calls to extend and to enrich ERP knowledge by considering aspects other than those already extensively studied (e.g. Al-Mashari, et al., 2003; Jacobs and Bendoly, 2003). Researchers such as Botta-Genoulaz and Millet (2005), Yu (2005) and Nicolaou (2004) urged the need to focus on the post-implementation stage and its issues, including ERP assimilation (Liang et al., 2007). The present research is primarily motivated by answering such calls.

Similarly, it has been argued that theories and instruments that are developed in IS field and validated in the Unted States (US)' context and Western countries in general need to be applied and validated across the global context (Deng et al., 2008). A second motivation was therefore to carry out a comparative study across two countries; a developed and a developing country win order to contribute in satisfying this need in IS research.

1.1. Research Objectives

Our research interest is in assimilation. This concept is defined as the extent to which the use of technology is diffused across organizational work processes and is incorporated in the businesses' managerial activities (Cooper and Zmud, 1990; Purvis et al, 2001). According to this definition, assimilation corresponds to the stages of "acceptance", "routinization" and "infusion" in Cooper and Zmud's (1990) innovation diffusion model while it corresponds to the "shakedown" and "onward and upward" stages of the ERP life cycle model suggested by Markus and Tanis (2000).

Research on IT assimilation has drawn significant attention because it is now agreed that it is IT assimilation, rather than IT investment that is the impetus behind IT impacts (Cooper and Zmud, 1990; Sethi and King, 1994). Assimilation is a fundamental link in the "causal chain of influence" of a technology that spans from its adoption to the substantiation of its impacts on the firm's business value and performance (Chatterjee et al., 2002).

In light of the crucial role that assimilation has on organizations, the present study seeks to investigate the factors that affect and promote ERP assimilation. Our primary objective is to provide insights in leverage points that managers should carefully consider in order to reap the ERP system's benefits and improve the firm's performance. Based on this objective, the main research question therefore of this study is the following:

What are the determining factors behind the variation in ERP assimilation among firms?

As defined earlier, assimilation is a multidimensional construct involving shallow and deep use, routine and innovative deployment, acceptance and diffusion of the system and support of operational control, managerial control and business strategy[2]. In spite of the central role of users in the assimilation process, previous research argued that IS innovations' assimilation depends not just on users' beliefs and attitudes but also on the management strategies and actions (Ives and Olsen, 1983; Leonard-Barton and Deschamps, 1988) as well as on the business's environmental context (Tornatzky and Fleischer, 1990).

Previous ERP post-implementation and system usage literature focused on several subjects such as evaluating the impact of ERP systems on the financial performance and on the value of business (e.g. Nicolaou and Bhattachrya, 2006; Jones and Young, 2006; Gattiker and Goodhue, 2005; Hitt et al., 2002), investigating users' behaviors and attitudes (e.g. Amoako-Gyampah, 2007; Hsieh and Wang, 2007; Calisir and Calisir, 2004; Wu and Wang, 2006), identifying the antecedents of the different stages of ERP projects (e.g. Nah and Delgado, 2006; Bajwa et al., 2004; Somers and Nelson, 2004) and evaluating and classifying ERP use (Botta-Genoulaz and Millet, 2005).

Although many of these studies touched on several contingency factors, an integrative framework depicting and connecting factors that promote ERP assimilation will be instrumental in enhancing our understanding about how and why some firms have better/worse assimilated systems than others.

A second objective of this research is to suggest an integrative framework of ERP assimilation and to investigate the relationship between ERP assimilation and some given factors in the organization's contextual environment (i.e. technological, organizational and environmental). To the best of our knowledge, no such systematic framework exists.

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[2]This classification is based on Anthony's (1965) taxonomy of managerial activities which he developed based on their time scale, management level, type of information used and degree of uncertainty involved.

Organizations differ widely in their assimilation of IT applications. Similarly, ERP practices and ERP projects' outcomes could broadly differ across countries with different cultural contexts, different economies and different IT structures (Ngai et al., 2008; Huang and Palvia, 2001). Indeed, the widely used ERP packages are developed in western countries, namely in US and some western European countries. For that reason, the business modules which are encapsulated in these software packages embed the developers' culture, norms, and values and reflect the industry practices in Europe and US. Both could be different from those of countries in other regions and could clash with the adopting firm's culture and practices and raise several issues and challenges.

Therefore, valuable lessons could be learned from ERP experiences in different parts of the world with different cultures, languages, economic conditions, government regulations, labor skills, and management styles. In spite of the growth of ERP markets in developing countries and the high risks companies could face, the bulk of ERP research focused on ERP experience in North America, mainly the US. This legitimizes the need for extensive studies in different regions in general and in less developed countries in particular. Needless to say that the previous and somewhat limited research in some developing countries focused squarely on ERP adoption and implementation issues mainly in the Asian context (e.g. Ngai et al., 2008; Ramayah and Lo, 2007; Rajapakse and Seddon, 2005; Sheu et al, 2004; Soh et al., 2003; Davison, 2002). Also, it is noteworthy that given the differences in contexts between developed and developing countries, previous research advocated the reassessment of theories that were administered in the context of industrialized economies in developing countries (Zhu and Kraemer, 2005).

In order to fill in the above mentioned research gaps, we decided to investigate the determining factors for ERP assimilation in the context of a developed country, Canada, and a country in the unexplored North African region in ERP research, Tunisia

In order to understand more fully the ERP assimilation issues and satisfy our research objectives, the following questions emerged:

1. Are there any contingency factors other than those that were pre-selected to guide our research could significantly influence the ERP assimilation process?

2. What challenges or impediments could hamper an effective ERP assimilation?

3. What differences in assimilation factors and challenges could exist between group of firms operating in a developed country and another operating in a developing country?

1.2. Structure of the Thesis

This thesis comprises six chapters. In the first introductory chapter, we presented the purpose of the study, the research objectives, and the structure of the thesis. The second chapter describes the research methodology that we adopted to answer the represent study's research questions. Among other sections, it includes a description of the data collection methods, the cases selection criteria, the analysis strategy and the validity and reliability measures that we took in order to ensure the research rigor and quality.

Next, three interlocking chapters, Chapters 3, 4 and 5, focus on bridging the theoretical and empirical gaps described above, namely:

- Chapter 3 (Article 1) presents a review of the relevant background literature and suggests a theoretical framework for the determinants of ERP assimilation.

- Using the theoretical framework that was developed in Chapter 3 as a guide for our empirical research, Chapter 4 (Article 2) presents a comparative study of three Canadian manufacturing companies and explores the determinants of ERP assimilation success during the post-implementation stage.

- Chapter 5 (Article 3) extends the geographical borders of the comparative study of Chapter 4 by including three Tunisian manufacturing companies. An exploratory research followed by a cross-case analysis identifies the drivers and the impediments to effective assimilation in both contexts.

Finally, Chapter 6 concludes the thesis by presenting summary of results, the study's contributions, its major findings, its limitations, and directions for future research. Other relevant material that we did not include in the main body of the thesis is included in appendices at the end of the dissertation's document.

CHAPTER 2 – Methodology

2.1. Introduction

This chapter outlines the research approach and methodology which we adopted throughout the present study.

In order to realize the research objectives and answer the corresponding research questions, we opted for an interpretive and exploratory approach. We also followed the multiple case study strategy to have an in-depth understanding of the experiences of the firms and the interviewees with the system and to shed light on the particularities of each ERP experience.

The remainder of this chapter is organized as follows. We start by explaining the different information systems (IS) research philosophical foundations. After that, we present our research method followed by data collection. The latter includes a description of the pilot study, the cases selection, the steps pursued to ensure access to the nominated cases, the participants, the data collection procedures, and the measures of confidentiality. Section 5 describes the analysis strategy of the present study. Finally, the last section explores the validity and reliability measures that we took in order to ensure the rigor and quality of the research.

2.2. Philosophical perspectives: IS research schools of thought

All types of research, whether qualitative or quantitative, have philosophical foundations and basic assumptions that guide the research about the appropriate method of conducting such research. In the context of IS research and organizational research, three main schools of thoughts are generally recognized: the positivist approach, the interpretive approach and the critical approach (Orlikowski and Baroudi, 1991; Myers, 1997; Walsham, 1995). Nonetheless, it is important to stress the fact that although the philosophical underpinnings of each approach are distinct, it is more difficult in practice to make clear cut distinctions between them and to find researcher who are strictly adhering to one of these approaches (Myers, 1997; Miles and Huberman, 1994).

The positivist school of thought focuses on theory testing in order to explain and predict the phenomena under study. The main assumption is that the researcher maintains objectivity and independence by using quantifiable data and measures of variables, formal logic and statistical rules to test hypothesis (formal assumptions) (Myers, 1997). Results of the studied sample are subsequently generalized to a stated population.

The interpretive school of thought sustains that "reality" is a social construction by human actors whose behaviors, perceptions constitute a central part of the study matter (Walsham, 1995). Understanding a social phenomenon occurs, therefore, through the meanings that the research subjects assign to it and through the interpretive research methodologies. The interpretive approach in IS research attempts to produce an understanding of the context of the information system, as well as "the process whereby the information system influences and is influenced by the context" (Walsham, 1995). Unlike the positivist approach, the interpretive research does not aim at testing predetermined hypothesis but rather attempts to explore new relationships of the reality by deeply probing

the subtleties of the context (Myers, 1997). With the increasing complexity of new information technology (IT) applications, there has been a move towards the interpretive approach in IS research using methods such as case study and grounded theory (Trauth and Jessup, 2000; Myers, 1997)

Unlike the interpretive and the positivist schools, the critical IS research is not limited to predicting, understanding, or explaining a social phenomenon. It rather attempts to critically evaluate and transform the studied social reality (Richardson and Robinson, 2007). Critical IS research, also referred to as post-positivist research and action research, consists of two main stages: a diagnostic stage and a therapeutic stage (Baskerville and Wood-Harper, 1996). The diagnostic stage aims at gaining insight into the hidden or less obvious aspects of social reality and analyzing it through hypothesis testing. Then comes the therapeutic stage which aims at transforming the existent by carrying out collaborative change experiments and developing a critical and relevant knowledge by introducing the change and studying its effects.

Following this overview of the three types of the philosophical underpinnings of IS research, the philosophical foundation of this research is interpretive. ERP systems are complex technologies requiring the intervention of several stakeholders, in and outside the adopting organization. Moreover, with the lack of research about ERP assimilation, adopting an interpretive foundation for our research would allow us to gain a better understanding of this process and its intricacies. Our objective is not to test any hypothesis, but rather to explore the different types of contextual factors (organizational, technological and environmental) that could influence it.

2.3. Research method

With the increasing interest in organizational and managerial issues in IS research, there has been a growing acceptance of qualitative research methods with the case study method being the most commonly used investigation method and an interpretive move in IS research in general (Yin, 2003; Myers, 1997; Darke et al., 1998; Walsham, 1995). Case study research is appropriate when a contemporary phenomenon needs to be investigated within its real life context "especially when the boundaries between phenomenon and context are not clearly evident and it relies on multiple sources of evidence" (Yin, 2003, p.13) and the "focus is on understanding the dynamics present in single settings" (Eisenhardt, 1989, p. 534). Hence, when behavioral events cannot be adequately controlled, and when little is known about a phenomenon due to the lack of theory, qualitative approach such as the case study method is highly recommended as an alternative means to gather evidence and to understand complex phenomena (Yin, 2003; Eisenhardt, 1989; Stuart et al., 2002). This method enables the researcher to learn about the phenomenon in natural setting using different perspectives (e.g. different sources of information, multiple accounts of different actors in the setting), while limiting the control and the manipulation of variables (Yin, 2003; Darke et al., 1998). These conditions apply to several areas in the IS field, such as ERP systems, where it is critical to investigate and to understand the context of some actions and not yet mature and settled phenomena (Darke et al, 1998). Indeed, ERP systems can only be utilized within a social structure -a department, a workshop, a plant, etc.-within the firm which has its own and unique characteristics. Moreover, the context of use of each system significantly affects the end results and the level of its assimilation.

It has been further argued that since organizational issues in the IS discipline are gaining greater interest compared to technical issues, the case study research methodology matches IS research (Benbasat et al. 1987; Myers, 1997). Darke et al. (1998) assert that case study research is an appropriate methodology to investigate IS development, implementation and use.

Two main research designs can be considered when using the case study research strategy: single case design and multiple case design, which we have chosen, to conduct our study. Single case design is used when the case is critical (it may meet all the conditions for testing a well formulated theory), when it represents an extreme or unique case, when it is representative or typical, when it is a revelatory case, or when a longitudinal case study is needed (Yin, 2003).

For our research we used the multiple case design essentially because we needed to study the assimilation phenomenon in two different contexts. We also used multiple cases within the same county. Our choice of this research design is justified by the following advantages.

Multiple case study designs are advantageous when a phenomenon is to be studied in different settings (Darke et al., 1998) resulting into a more robust and compelling study (Yin, 2003). A multiple case study could be used to describe a phenomenon, test or generate theory (Eisenhardt, 1989; Riege, 2003). Multiple cases replicate the pattern-matching and, hence, strengthen the results and increase the confidence in the robustness of the theory (Tellis, 1997). According to Miles and Huberman (1994), multiple cases help generalizing the results, provide deeper understanding of the studied phenomena and their outcomes, increase the chances to test hypotheses, and give a good picture of causalities. It is important, however, to stress that neither multiple cases should be considered as multiple respondents in a survey, nor individual cases should be considered as sampling units (Yin, 2003). Indeed, the logic underlying multiple case studies is not the statistical generalization of results to a population. It is rather the analytic and the theoretical generalization which is achieved when the case study results are used to develop theory or to test previously developed theory (Yin, 2003). Hence in a multiple case study, cases are either used to predict similar results (literal replication) or to predict contrasting results but for predictable reasons (theoretical replication) (Yin, 2003, p. 47). The case studies results would help

therefore develop and enrich the theoretical framework by identifying two different sets of conditions: those when the studied phenomenon is likely to occur (literal replication) and those when that same phenomenon is unlikely to occur (theoretical replication). The resulting framework could be later used for generalizing for new cases.

2.4. Data collection

2.4.1. Pilot Study

After reviewing the theoretical and empirical literature relevant to our study subjects, we developed a preliminary theoretical framework to guide our research. As the research was exploratory, we chose not to specify any formal hypothesis that could act as an impediment to discover important insights and new dimensions while realizing the research. This decision added flexibility to our research and ensured that the resultant model was based on empirical evidence rather than solely on the researcher's preconceptions (Eisenhardt, 1989).

Next, we designed an interview guide and conducted a pilot study in three Canadian manufacturing companies, in the province of Quebec, where we pre-tested our interview guide by interviewing the IT managers of each company. As argued by Yin (2003), convenience, easy access and geographic proximity were the main reasons for conducting our pilot study in Quebec and in the companies that we chose for our pilot study.

The pilot study allowed us to make sure that the respondents understood the questions, to improve those questions that were ambiguous, have an assessment of the length of time that the interviews needed, properly organize the questions and add or

eliminate questions to better serve our research needs, identify some of the logistical and practical problems to avoid during interviews and site visits.

2.4.2. Sampling: Selection of cases

The following step in our research strategy was case selection (sampling). Unlike quantitative research, where sampling is random with the objective of collecting data that is statistically representative and obtaining accurate statistical evidence about the variables within the population, case study research uses theoretical sampling that aims at finding evidence that allows the exploration, refinement, support or discredit of theories (Eisenhardt, 1989; Miles and Huberman, 1994). Cases could be therefore chosen to enable literal and theoretical replication (Eisenhardt, 1989; Yin, 2003).

The selection criteria which we considered were the following: 1) the participating firms should be manufacturing firms with three located in Canada and three located in Tunisia with matching industries if possible (same industry for each pair of firms in each country); 2) the firms should have implemented at least three modules 3) the system should be implemented for the firm's operations management business processes and 4) the system should have been used for at least one year for operations (inventory management, production, materials procurement, etc.), 5) the company should be ready to give access to information and to be available for the interviews.

Six cases, all belonging to the manufacturing industry, were selected for this study with three cases located in Canada and the other three in Tunisia. The number of cases was chosen so that the differences and similarities allow for literal and theoretical replication while maintaining a manageable and economic study. There is, in fact, no specific number of sites to be used for multiple case study research. Nevertheless, it has been suggested that

a range of 2 to 10 cases would be possible for a robust and successful study (Eisenhardt, 1989; Yin, 2003; Stuart et al. 2002).

Cases in this study were selected so that they allow theoretical and literal replication. Indeed, this study allowed us to identify the factors or the conditions that enhance the assimilation process (literal replication) and those that moderate it (theoretical replication). Literal replication was clear when cases with similar conditions yielded similar results while theoretical replication was evident when cases with dissimilar conditions produced contrasting results.

Chapter 3 and Chapter 4 provide a detailed description of the selected cases of the present study.

2.4.3. Accessing the nominated cases

One of the basic steps in case study research is to be able to access the candidate sites and informants in order to ensure the best possible data quality. Despite the fact that several "good" candidate companies have been chosen, accessing most of these firms was not as easy as we expected. Our empirical research was realized in two main stages: Canadian firms were first realized during the period: November 2006-May 2007 while the Tunisian cases were realized during the period: October-December 2007.

Concerning the Canadian cases, in spite of the official measures of confidentiality that we took, getting the approval of several candidate firms to participate in the research was difficult. The refusal was justified by several reasons such as the dissatisfaction of some firms with their system's performance, their refusal of sharing the experience with external

parties, the lack of time and the heavy workload of the informants, the firm's doubts concerning the non-disclosure of the collected information. We were able, however, to have the approval of three manufacturing companies: the first one was a partner of the For@c research consortium. The second one was a research partner of the university. Hence the cooperation of a professor with a key person in the firm was valuable to have access to the company. For the third Canadian firm, the intervention of my supervisor with one of the firm's managers was valuable to facilitate our admission to the firm and to establish contacts with the required key informants.

As for the Tunisian cases, the fact that the researcher was present on site (in Tunisia) during the second stage of the empirical research facilitated considerably the choice and the access to the chosen firms. After an internet search on Tunisian firms that implemented ERP systems, five firms were preselected. The intervention of a consultant was very helpful to establish the initial contacts with two selected firms. After a visit and a discussion with its IS manager, one of the firms was eliminated since the case did not meet our selection criteria. For case D, the researcher and the research assistant went in person to the firm and met the IT manager who accepted to include his company in the research and was very cooperative by arranging tour meetings with the other key informants located in two different sites of the company. The second firm (Case E), however, was retained for our research. After an initial contact by phone with the IT manager and after explaining to him the research and its requirements, we had the approval to consider that firm in our research.

For all the cases, an initial contact with the key person in the firm to explain orally the research objectives and requirements was the initial step of the case studies. The key person was also provided with copies of the non-disclosure statement and the interview protocol.

2.4.4. Participants

Most often, the participants for this study included the decision makers who use (directly or indirectly) the ERP system as a source of the information they use and who influence, in one way or another, the firm's operations activities. Using multiple informants in each company was instrumental in strengthening the reliability and validity of the findings (Yin, 2003). Depending on the availability and the type of tasks of some managers, we had to interview people other than those who were identified before starting the empirical work. Also, we needed to meet the IT manager in order to have an overall idea about the project and the IT infrastructure in the company. Table 2-1 presents the respondents in each studied company.

Table 2-1 Interviewed Informants for Each Case

Company	Participants (informants)
Case A	▪ Operations manager ▪ Finance manager ▪ IT manager ▪ Marketing manager ▪ Production manager ▪ Plant manager ▪ A programmer
Case B	▪ Operations/production manager ▪ IT manager ▪ Marketing manager ▪ Planning manager ▪ Plant manager
Case C	▪ Operations manager ▪ IT manager ▪ Sales and marketing manager ▪ Controller ▪ Accounting manager
Case D	▪ IT manager ▪ programmer ▪ Sales manager ▪ Operations manager/plant manager ▪ Controller ▪ Accounting manager
Case E	▪ Operations manager ▪ Accounting manager ▪ IT manager ▪ Marketing manager ▪ Plant manager
Case F	▪ Operations/Plant manager ▪ Finance manager ▪ Modules programmer ▪ Sales and marketing manager ▪ Head of the finance ERP roll-out unit (link between managers and IT people)

The research participants were assured that their organization's name would remain anonymous. This encouraged the informants to speak openly and honestly about different issues. The results of the research were offered to the participants. They were also notified of the ability to withdraw at any time from the research. This provided an incentive to participate and reduced the fears of identifying disclosed information.

2.4.5. Data collection procedures

Our primary source of evidence was the interview. The purpose of the interviews was to provide details about each cases ERP experience, to investigate the assimilation experience in each firm, to explore the drivers that promote ERP assimilation, and to identify the issues that moderate the assimilation process. In order to increase the consistency, efficiency and flexibility of data collection, in-depth semi structured interviews were used. The interviews were realized by the researcher and a research assistant with theoretical sensitivity to the research subject. Eisenhardt (1989) points out that the advantage of using multiple investigators is the increased creative potential of the team and the convergence of observations that potentially enhances confidence in the findings.

An interview protocol was developed to guide the interview. It included semi-structured questions based on the literature review and using the theoretical model's construct as a starting point, as well as open questions to provide ample opportunities for the interviewees to elaborate and to talk openly about their opinions and their experiences. Extra secondary questions were brought up during the interviews to probe for details and to discuss issues mentioned by the interviewees. Respondents talked freely especially after being reassured about the anonymity of the interviews. We also encouraged open discussions toward the end of each interview allowing interviewees to ask any questions and add any comments they might want. Several respondents were contacted more than

once over the course of the study, either on-site or by mail or by telephone to assess the consistency of their responses and to have extra information or to gain deeper understanding of the points that were relatively overlooked during the initial interview.

Each interview lasted between 40 and 90 minutes. The interviews were tape-recorded, with the prior permission of the interviewees who all accepted to record the conversations. Tape recording prevented several problems that occur when only notes are taken. This is the case with major problems such as conversation interruption and slow-down, missing parts of conversations, and losing concentration on interviews.

During each interview, session notes taken by both the researcher and the research assistant were then grouped, sorted and organized after each visit to ensure that all of the important data was preserved. Each interview started by presenting the research study. The interviewee was, then, asked general questions about his or her job, position, functions, etc. After that, we proceeded to more in-depth questions in relation with the research questions and the research constructs. The reports were sent back to the interviewees to peruse and for changes to be made to potentially confusing information. Field notes and archival data documents such as on-line data and documents provided by some respondents represented additional sources of data that enriched the collected data through interviews, and helped in the triangulation of the different types of data.

2.4.6. Measures of confidentiality

Prior to carrying out the interviews, an ethics application was approved by the "Comité d'éthique à la recherché" (research ethics board) at Université Laval. The application included the recruitment message, a consent form to be filled by each participant, the non-disclosure statement signed by the research and her assistant. This is in addition to the interview protocol.

Demographic information about the firm (name, number of employees, revenues, etc.) was to be disguised if the firm desires. Similarly, the interviewees were to be referred to by their roles and not their names. Data collected during the research will be destroyed once the study is over.

2.5. Case study analytic strategy

Data analysis is the process of making sense of the massive amounts of rich accumulated data. Data analysis is the heart of case study research and the most difficult and challenging stage (Yin, 2003). This is largely due to the volume and variety of the collected data that needs to be manipulated, reduced and interpreted (Yin, 2003; Darke et al., 1998; Eisenhardt, 1989). This central stage of case study research method is, however, the least developed stage and, unlike quantitative research; there are no formal rules to follow (Eisenhardt, 1989; Miles and Huberman, 1994). The researcher should, therefore, rely on experience, the literature, and skills such as data management, interpretation in order to be able to extract the "make sense from chaos" (Stuart et al., 2002).

Our data analysis included two main stages: within-case analysis and cross-case analysis (Eisnehardt, 1986) using the principles of the pattern matching analytical strategy (Yin, 2003). Cases analysis was preceded by an essential step that consisted in organizing, identifying, coding and categorizing our data. First, the different types of data from different sources (interviews, documents provided by some informants and online resources) were grouped and organized in six databases, one for each case. Next, we proceeded to data reduction. Data reduction and transformation consists in selecting, sorting, simplifying, abstracting, paraphrasing, and organizing the raw data which was collected (Miles and Huberman, 1994). Once the interviews were transcribed, a first reading of each interview provided us with an overall idea of the content. While reading

over the transcripts, key phrases were highlighted and reflective remarks and notes were marked in the margins in order to add clarity and meaning to the transcripts which helped us form a general picture of what was being discussed. According to Miles and Huberman (1994) and Yin (2003), these remarks and ideas represent the researcher's perceptions and thought that were visibly converted to allow reflection. At the same time, codes that relate to the themes and constructs of the original theoretical model were attributed to clauses, sentences and words of the transcripts. Codes, with their corresponding data units were then categorized into tables in order to facilitate insight and comparison. Over the course of the transcripts' codification process, emerging codes and categories were compared with the already established ones in order to reorganize the categories.

Following these steps, our data was ready for within-case analysis and cross case analysis.

2.5.1. Within-case analysis

Within-case analysis helps researchers in becoming "intimately familiar with each case as a standalone entity" (Eisenhardt, 1989, p.540) before proceeding to the higher level cross-case analysis. Also, within-case analysis has the advantage of assisting researchers in their handling of the big volume of data and clarification of various patterns of each case before generalizing them across cases. As was mentioned earlier, we adopted the pattern matching analytical strategy for our research. This strategy compares an empirically based pattern (or theme) with the theoretical pattern. Hence, throughout the study, case study evidence that was classified into categories was frequently compared with the theoretical model to explore the model's constructs, identify relationships and provide initial validation for the model (Eisenhardt, 1986; Yin, 2003). Dada interpretation and analysis were considerably facilitated by visually displaying the findings in matrices (Miles and Huberman, 1994). For each case, we constructed a (checklist) matrix that included the theoretical variables that were originally identified from literature, the key factors

(empirical categories) that emerged from the empirical data and the corresponding data units from the original transcripts. Similarities and differences between findings were highlighted. Following this analysis, we were able to have an idea regarding the general context of each case, their level of assimilation and the favorable or unfavorable conditions that contributed to the exhibited level of assimilation.

2.5.2. Cross–case analysis

A fundamental reason for cross-case analysis is to deepen the understanding of the studied cases (Miles and Huberman, 1994). Moreover, studying and comparing multiple cases with varying experiences (positive and negative) helps strengthening the final conceptual framework by checking for any literal replications (similarities) and theoretical replication (different/contrasting results) (Miles and Huberman, 1994; Yin, 2003). For our research, for each empirical category (that was identified during the transcripts analysis), a matrix grouping data units by case was set in order to pin down any matching patterns. Correspondingly, we examined cases where, based on our theoretical model, contrasting patterns were located. Replication of findings among cases and corroboration with the theoretical model categories suggested retaining the category in question for the final model. For the case of the empirical categories which emerged during the cases analysis, replication of findings among cases and convergence of patterns suggested adding and including new category to the our final model of ERP assimilation.

2.6. Research validity and reliability

Achieving reliability and validity is a major concern for any qualitative researcher as they significantly impact the overall rigor and trustworthiness of the study (that is the confidence in the data collected and trust in the successful application and use of the results) (Golafshani, 2003; Riege, 2003). Therefore, several measures should be taken during different stages of the research (including research design, data collection, report

writing and data and results analysis) in order to establish and improve the research reliability and validity (Golafshani, 2003). Four key measures or design tests are generally used to ensure validity and reliability in qualitative research. The latter are: reliability, construct validity, internal validity, external validity and reliability. It is to be noted here that a number of scholars proposed four analogous tests which are: 1) dependability which corresponds to reliability, 2) confirmabiltiy which is analogous to construct validity, 3) credibility which is the parallel construct to internal validity and 4) transferability which matches up with the notion of external validity (Riege, 2003).

2.6.1. Reliability (Dependability)

Reliability or dependability in case studies aims at demonstrating stability and consistency in the research processes and ensuring the ability to replicate the research by applying its operations and procedures and achieve similar results (Yin, 2003; Miles and Huberman, 1994; Riege, 2003). The reliability of our research was strengthened by conducting a pilot study in three manufacturing firms, using a semi-structured interview protocol, tape-recording the interviews, maintaining a database of findings and evidence (including hard copy documents, tape-recorded interviews, notes taken during visits, online documents etc.). Involving a research assistant who is knowledgeable about the research subject and having key informants review the case report for confirmation or adjustments were additional measures to improve reliability. Finally, discussing and reviewing the data analysis and the findings with the research assistant, my research supervisors and other colleagues further contributed to establishing reliability.

2.6.2. Construct validity (Confirmability)

The purpose of the construct validity or confirmabilty test is to ensure that bias and subjectivity are limited throughout the research (Miles and Huberman, 1994; Riege, 2003). There has been, in fact, criticism about the risk of researcher subjectivity when collecting data (Yin, 2003; Riege, 2003). Indeed, as a growing number of studies have shown, the fact

that researchers have direct contacts with the study's participants increases the risks of bias and subjectivity in a case study research (Riege, 2003). We overcame this problem by multiplying the sources of evidence (multiple informants in each company, companies' internal documents and online documents) in order to limit bias and to be able to cross check the collected data. Construct validity was also strengthened by having the key informants and the research assistant review the case report.

2.6.3. Internal validity (Credibility)

Internal validity or credibility test reflects the extent to which causal relationships could be established (Yin, 2003; Riege, 2003). This test aims at ensuring the credibility of the investigation by ensuring that the concepts are systematically related and that the findings are internally coherent (Riege, 2003). The researcher's tasks consist, hence, in showing the patterns of similarities and differences between the respondents' experiences and identifying the conditions that influenced those patterns (Yin, 2003; Miles and Huberman, 1994; Riege, 2003). Internal validity was strengthened by using within-case analysis followed by cross-case and cross-nation analysis and pattern matching. Credibility of the research was also enhanced using triangulation techniques during data collection (such as multiple informants, online resources, company documents) and data analysis (within-case, cross-case analysis, tables and matrices). Finally, presenting the data analysis and the findings to my research supervisors, the research assistant and colleagues helped ensure the research's credibility.

2.6.4. External validity (Transferability)

External validity or transferability test assesses the analytical generalization of the research findings (Yin, 2003; Riege, 2003). With this test, the researcher attempts to generalize the obtained results to some broader theory (Yin, 2003). Several measures were taken in order to improve the research's transferability. Using the replication logic for multiple cases (six cases) across two different countries allowed us to identify the

conditions which foster the ERP assimilation process (literal replication), as well as those that could hamper it (theoretical replication). In addition, the comparison of our findings with extant literature and the confirmation of our findings was another measure for improving the research's external validity.

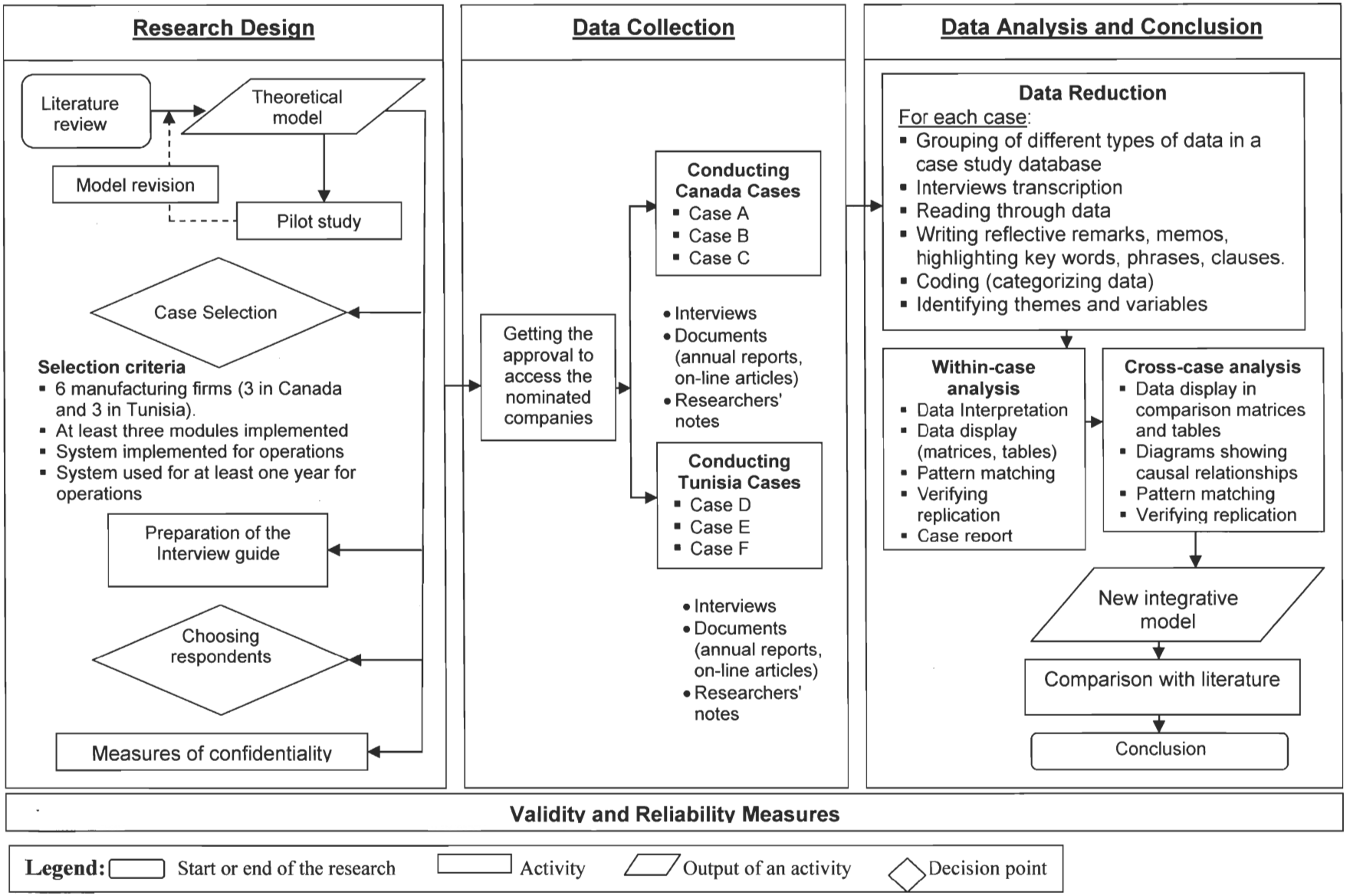
The following table summarizes the different validity and reliability tests as well as the tactics that we applied to ensure the quality of our research.

Table 2-2 Validity and Reliability Measures

Test	Description	Adopted Tactics
Reliability/Dependability	Demonstrating stability and consistency in the research processes Demonstrating that the operations of a study can be repeated, with the same results	▪ Pilot study ▪ Interview protocol ▪ Tape-recording the interviews ▪ Maintaining a database of findings and collected data (hard copy documents, tape-recorded interviews, notes taken during visits, online documents) ▪ Multiple (two) researchers ▪ Key informants ,review the case study report ▪ Research supervisors, research assistant and colleagues to review data analysis and conclusions
Construct validity/ Confirmability	Ensuring objectivity and limiting bias and subjectivity throughout the research	▪ Triangulation : using multiple sources of evidence in the data collection phase (multiple informants (at least 5)per case , tape- recorded interviews, company documents, researchers' notes, online resources) ▪ Verbatim interview transcripts and notes with sufficient citations for the different portions of each case study database ▪ Key informants and research assistant review cases reports
Internal validity/ Credibility	Extent to which causal relationships could be established Ensuring research credibility	▪ Within-case analysis ▪ Cross-case analysis ▪ Cross-nation analysis ▪ Pattern matching ▪ Cross-checking results with my research supervisor, the research assistant and colleagues
External validity/Transferability	Ensuring the analytical generalization of the research results	▪ Literal and theoretical replication logic for multiple cases across two different countries ▪ Comparison with extant literature

The following figure illustrates the steps we followed to realize our research. The research comprised three main stages: research design, data collection and data analysis and conclusion. During the first stage, the theoretical model was developed based on the literature review and the pilot study. Next, the cases were identified based on our selection criteria. The interview guide was, then, prepared and the respondents were chosen. After taking the necessary measures of confidentiality, we required the approval of the chosen companies to take part in our research. The cases in both countries were realized with data collected primarily from the semi-structured interviews. The collected data was, then, reduced to be analyzed. Following a within-case analysis and a cross-case analysis, a new integrative model of the determinants of ERP assimilation was developed. After that, the resultant research outcome was compared with the literature and a conclusion was drawn based on that discussion.

Figure 2-1 Research Methodology



CHAPTER 3 - ERP Assimilation Challenge: An Integrative Framework for a Better Post-Implementation Assimilation

3.1. Introduction

ERP systems have proven to be one of the most important emerging information technologies in the recent years (Davenport, 1998). Although with a slow pace, ERP systems kept evolving in response to the changing market demands and the technological developments. Some of the main trends of ERP systems developments include the following: improvements in flexibility and integration, extensions to e-business applications, broader reach to new users, and the adoption of Internet technologies (Mello, 2002). If implemented properly and fully comprehended and assimilated by target users, ERP systems can have tangible and intangible implications for all functional areas in a company (Gefen and Ragowsky, 2005). Unsurprisingly, and according to a recent ARC Advisory Group study the ERP market has so dramatically increased that it has reached a value of $16.67 billion in 2005 and is forecasted to be over $21 billion in 2010. Despite the large-scale adoption of enterprise systems, attaining the expected benefits is still a challenging task. While a number of companies have enjoyed the benefits of ERP systems, others have had to scale back their initiatives and to accept minimum payoffs or to simply give up their ERP project (Markus et al., 2000; Soh et al., 2000; Al-Mashari and Al-Mudimigh, 2003; Umble et al., 2003). In fact, it has been estimated that more than 60% of ERP projects are unsuccessful (Rockford Consulting Group, 2004) and between 50 and 70% of these projects fail to achieve the desired benefits (Al-Mashari et al., 2003; Loh and Koh, 2004).

ERP assimilation and the concomitant realization of long term advantages have often been implicitly assumed to be achieved when the ERP project ends on time and within the given budget. In many cases, such an assumption, as strongly argued by Markus and others, has proven to be erroneous (Markus et al., 2000). Indeed, ERP failure can have different degrees and can occur at different instances of the ERP life cycle (Markus et al., 2000; Donovan, 2001). It has been argued that ERP failure occurs when the installed system is underutilized and, hence, many of the idiosyncratic features have not been fully extended by their target users (Davenport 1998; Donovan, 2001; Jasperson et al., 2005).

All these issues raise questions about the critical ERP post-implementation stage for the system's survival and its assimilation in the company. It is during this stage that the effects of uncontrolled problems in previous stages appear due to the fact that users start the exploitation and the evaluation of the system. During the implementation stage, users are usually limited to learn the basic functionalities to help the system go live. Unlike clerical workers who use the system for routine tasks, experienced users need a few months to feel comfortable with the system and to trust it for their key tasks (Musaji, 2005). Perceiving the systems as being complex, intrusive and threatening, many users would limit their use to the basic and usual tasks. At the same time, and because they fear to look inept to use the system, they would try and test some features of the system which are the easiest to learn and with the least risk of error (Musaji, 2005). As a critical mass of users start mastering the system and they see its advantages on their work and its capabilities, they start using it in a more creative way and exploring its more advanced functionalities and requiring, even, more functions to be added (Musaji, 2005). These are, in fact, some of the signs of the system's acceptance and assimilation which is very crucial and essential for the system's success. In order to fully benefit from the system's potential, the system needs to be fully assimilated in the firm (Armstrong and Sambamurthy, 1999; Purvis et al., 2001; Chatterjee et al., 2002). In order to efficiently assimilate the system, the firm needs to deeply understand the system's technology and capabilities, and to integrate it into its value chain functions (Chatterjee et al., 2002).

Despite the growing interest in the post-implementation phase of ERP projects (Botta-Genoulaz et al., 2005) and the system's assimilation, there is still a dearth in this research area (Kwon and Zmud, 1987; Fichman, 2000; Shehab et al., 2004). This has left the "failure after success" cases unresolved. This could be explained by the lack of a theory that guides the empirical research. Moreover, most of the realized studies that have examined the issue of ERP systems have implicitly assumed that ending the project on time and within budget would eventually guarantee long term advantages, ignoring the events which could emerge later which could radically change the project's performance. These suggest that there is a strong need to develop an adequate understanding of how and why the post-implementation period of some ERP implementations contribute to the provision of more business benefits than others.

This study differs from previous research by moving beyond the implementation stage so as to concentrate on the assimilation process which characterizes the post-implementation stage. First, there is a dearth of theory based research about post-implementation assimilation. Next, ERP systems represent a complex technological innovation for a firm. The firm could therefore encounter significant challenges when learning and assimilating the system in order to achieve the desired benefits (Teo et al., 2006). Moreover, possessing and mastering the use of an ERP system have become a critical asset for firms in order to be ale to adapt to environmental changes. For these reasons, both the diffusion of complex innovation theory and the institutional theory will be used in order to understand the ERP systems assimilation process. Most of the studies which used the diffusion theory examined the adoption antecedents. Little work has been done, however, when it comes to the post-implementation assimilation process. Using the institutional theory would further enrich the model and help investigating the external forces which would encourage (or hinder) ERP assimilation.

Building on ERP implementation and IT diffusion literature, we have developed an integrative conceptual model for ERP assimilation during the post-implementation stage of the ERP project life cycle. The technology–organization–environment (TOE) framework (Tornatzky and Fleischer, 1990) will be adopted in order to explain the determinants of ERP assimilation. Our objective in this paper is to present an integrative conceptual model through trying to answer the following questions:

- What are the factors that influence the assimilation of ERP in manufacturing firms?
- How does the assimilation of ERP systems affect the benefits realized from deploying these systems?

The rest of the paper is organized as follows: section 1 gives an overview of ERP systems and explores a number of ERP challenges which would impede the ERP assimilation process. Section 2 explains the assimilation concept. Section 3 provides a general idea about prior work and highlights our contributions. Section 4 is devoted to the ERP assimilation model that we propose, including a description of the TOE framework and of the different determinants that we have identified. Finally, in the conclusion we highlight our research contributions and delineate the methodology we will follow to empirically test our research model.

3.2. ERP Systems Challenges: Impediments to Assimilation

An ERP system is a packaged business solution that is designed, through a central database, to automate and integrate many (possibly all) business processes in an organization (Jacobs and Bendoly, 2003). ERP systems are intended to be a "(central)

comprehensive and integrated database which collects data from and feeds data into modular applications supporting virtually all of a company's business activities – across functions, across business units, across the world" (Davenport, 1998, p.123). Three main components constitute an ERP software: 1) a central database which represents the foundation of the system, 2) transactional application modules for the collection and maintenance of data in the central database, and 3) information generating application modules used to retrieve multiple views of the data. Many industries and various functional areas are served by ERP with the attempt of automating and integrating operations including supply chain management, inventory control, manufacturing scheduling and production, sales support, customer relationship management, financial and cost accounting, human resources, and any other management process (Hitt et al., 2002).

Adopting an ERP system is a challenging and complex organizational learning and change management process (Davenport, 1998; Kumar et al., 2003; Tchokogue et al., 2005). Indeed, the required reengineering of business processes, the heavy investments in time as well as material and human resources significantly increase the risks and challenges of ERP projects (Kumar et al., 2003). While a rapid and smooth adoption might reveal initial success, implementation quality can result in underutilization of the product and in customer dissatisfaction (Markus et al., 2000).

Despite the attempts to lower the degree of complexity of the systems and the developments of various mid-range ERP systems, many organizations are still experiencing failures of their ERP initiatives (Somers et al., 2000). An effective system implementation is therefore a necessary but not sufficient condition to fully benefit from the system's potentials. In order to generate significant business value, the innovation should be integrated and embedded in the corporate value chain before it can generate business value (Kwon an Zmud, 1987; Delone and McLean, 2002).

Several ERP challenges and failure reasons have been reported in the literature. Davenport (1998), for instance, reports that one of the reasons for the failure of ERP is that organizations fail to reconcile between the requirements of its human and business systems and those of the new technological system. ERP failure has been also attributed to a plethora of reasons: the complexity of ERP systems, the lack of ERP product knowledge (Chang, 2004), the systems inappropriate project management, the lack of executives commitment, the lack of expertise to support the organization holistically in every single ERP module, the unclear business objectives, the poor communications, the lack of project methodology or poor adherence to the methodology used, the immature product releases, the mismatch between the delivered applications and the organization's expectations, the resistance to change within the organization, and others (Bagchi et al., 2003; Umble et al., 2003; Loh and Koh, 2004).

Markus et al. (2002) investigated different road blocks in an ERP life cycle. Given that many projects have been terminated during the post-implementation phase, exploring the challenges of this phase has been of an increased importance. In order to be fully and properly deployed, the system needs to be accepted by its users. One major problem, however, is the lack of commitment, acceptance and readiness of the users to deploy the system (Markus et al., 2000; Kumar et al., 2003). These could be explained by the lack of appropriate training which keeps users continuously rely on project team and technical support personnel, lack of education about the system's advantages and different functionalities, lack of support documentation, failure to retain people who understand the system, high user turnover and difficulty of recruitment on new computer savvy hires (Markus et al., 2000; Kumar et al., 2003). Technology related problems are also another major road block during the post-implementation phase. These include risks of malfunctioning due to bugs in the software and data inconsistency, unreliable hardware, lack of documentation about system configuration to support evolving business needs.

All of the abovementioned challenges and problems would eventually negatively affect ERP assimilation.

3.3. The Concept of Assimilation

Organizational IT assimilation has been of an increasing interest to researchers in information systems (IS) for more than a decade (e.g. Cooper and Zmud, 1990; Fichman and Kemerer, 1997; Chatterjee et al., 2002). The Webster's New Collegiate Dictionary defines to assimilate as "to absorb into the system" and "to take into the mind and to thoroughly comprehend". Even though the concept of assimilation originated in anthropology, it has been used in several other disciplines, such as marketing, research and development and management science. One of the main applications of the concept is the assimilation of new technologies in organizations, both at the organizational and the individual levels. In anthropology, immigrants assimilation, also called incorporation, characterizes "the degree to which members of immigrant groups forge primary relations with native-born members of other ethnic groups" and "fully enter into the societal network of the host society" (Brown, 2006, p75). The assimilation concept has also been used in the case of organizational new comers and has been interchangeably used with socialization. Assimilation refers, in this case, to the process by which individuals from one cultural group become a part of or "blend" into a second group (Flanagin and Waldeck, 2004).

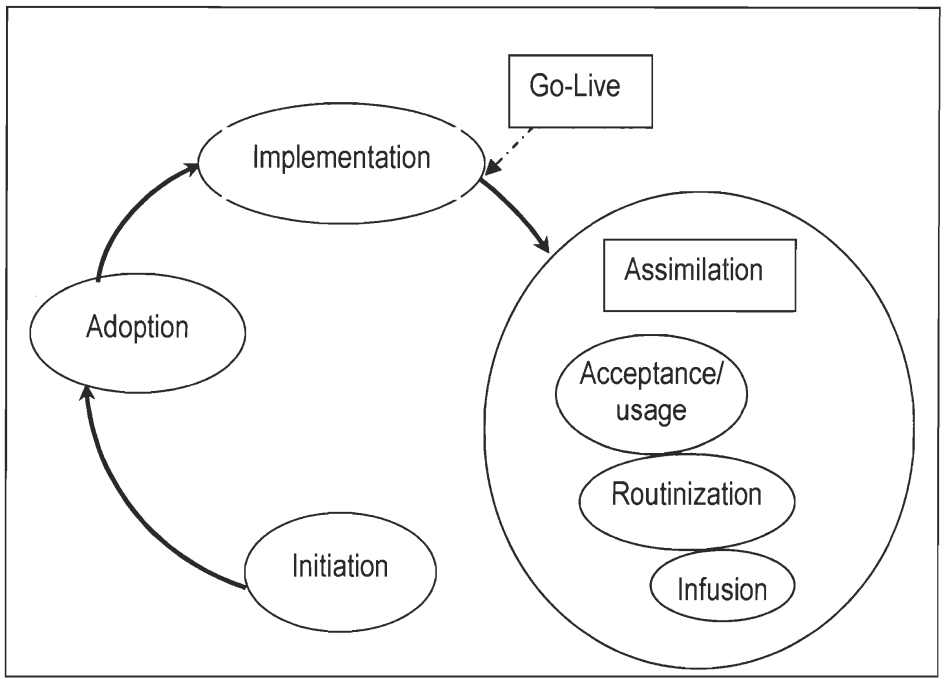
When it comes to the IS field, IT assimilation is considered to be a central objective and an essential outcome of the adoption and implementation efforts (Armstrong and Sambaburthy, 1999). As a matter of fact, past researches had argued that prior to being able to come up with a successful business, a new technology is to be fully integrated and imbedded into the value chain of the given firm (Delone and Mclean, 1992).

Assimilation definitions in IS varied between designating one to several steps of the innovation diffusion and implementation process. For Gallivan (2001), for instance, assimilation refers to the six stages of the organizational IT adoption and implementation of

Zmud and colleagues (i.e. Kwon and Zmud, 1987; Cooper and Zmud, 1990). These stages are: initiation, adoption, adaptation, acceptance, routinization and infusion. Assimilation has been also used to refer to the process which extends from the initial awareness of the innovation, to its potential acquisition and wide-scale deployment (Fichman and Kemrer, 1997; Fichman, 2000). The process includes awareness, interest, evaluation, trial, commitment, and deployment (limited then general deployment). Diffusion only occurs when the technology spreads across a population of organizations (Fichman, 2000). In other studies (e.g. Agarwal et al., 1997; Armstrong and Sambamurthy, 1999; Ranganathan et al., 2004; Raymond et al., 2005), assimilation has been distinguished from adoption. While the latter refers to the decision about using or not the technology, assimilation refers to the extent to which the technology used in a comprehensive and integrated way and becomes routinized and embedded in the firm's work processes and value chain activities (Armstrong and Sambamurthy, 1999; Purvis et al., 2001; Chatterjee et al., 2002). In the case of ERP systems, Bajwa et al. (2004) consider five stages in the ERP assimilation process, which they call also the ERP life cycle. These stages are: awareness for the need of implementing an ERP, selection of package, preparation, implementation and operation.

For the purpose of our research, we will consider assimilation as the extent to which the organization has progressed from understanding the ERP systems' potential and functionalities to mastering and deploying them in their key value chain processes. If compared to Cooper and Zmud (1990) stage model, this process occurs during the post-implementation stage of the ERP life cycle and more specifically after the system goes live, as shown in Figure 3-1.

Figure 3-1 ERP Assimilation Process in Relation to the Other Processes



We have to note also that assimilation can take various degrees. The firm and the system's target users start first by getting comfortable with the system by relying on it for their key tasks (Musaji, 2005). Once the system is mastered, users would try to push the system's limits some steps further by using it in creative ways and by requesting new functions and enhancements to the system (Musaji, 2005).

3.3.1. Assimilation of Complex Technologies

In order to comprehend the assimilation phenomenon, we will use the diffusion of innovation theory. It has been suggested that there are functional parallels between IS implementation in general and diffusion of technological innovation (Kwon and Zmud, 1987; Fichman, 1992; Premkumar et al., 1994). The main advantage of borrowing the innovation diffusion theory is that it has already a valuable cumulative tradition and that it

provides a strong theoretical base for IS researchers for evaluating IS and IS projects and for assessing the possibilities of the diffusion of the technological innovation and its incorporation within the organization (Kwon and Zmud, 1987; Fichman, 1992; Premkumar et al., 1994).

The classical diffusion theory posits that innovation adoption process consists of pre-adoption activities embedded in the initiation stage and post-adoption activities that facilitate implementation and continued use of the innovation (Rogers, 1995). The classical model has, however, received much criticism when applied in the context of complex organizational innovations (Attewell, 1992; Fichman, 1992; Rogers 1995). This model focused primarily on simpler innovations being adopted autonomously by individuals. These conditions make it unsuitable for innovations adopted by organizations where the decision making is dependent on several parties. Unlike simple innovations and technologies, adoption, implementation and deployment of complex technologies[3] are big decisions requiring complex organizational process and group decision making.

Rogers' basic model (1983) has been refined by Cooper and Zmud (1990) which have extended it into a six-stage model for technology innovation implementation namely: initiation, adoption, adaptation, acceptance, routinization and infusion. During the initiation stage, pressure to change evolves from either organizational need or external forces or both. This need for change would be acknowledged by a key member or a group of members in the organization who rationalize the choice of an innovation. As a result, key managers at this stage realign their priorities and invest the necessary resources in the change effort (the technology adoption). In the third stage of adaptation, the organization is prepared for the organizational innovation. This stage involves the technology installation and maintenance along with the revision and development (reengineering) of the organizational procedures

[3] "A complex technology is defined as a technology when first introduced, imposes a substantial burden on would-be adopters in terms of the knowledge needed to use them effectively" (Fichman and Kemerer, 1997).

and processes if necessary. In order to ensure the technology acceptance and to lower resistance to the new way of operating in the organization, tactics such as communication and employee participation are employed. During the fourth stage of acceptance, users are induced to commit to the new technology through training, for instance. This stage is one of the early indicators of the technology acceptance in the firm. Acceptance would be exhibited by the changed attitudes and work habits and by starting to use the technology in the organization's work. During the two final stages of routinization and infusion (assimilation), the innovation gradually takes root as it is increasingly used in a more comprehensive and integrated way to its fullest potential.

Hence, researchers in the innovation adoption and implementation field have asserted that the internalization and the effective use of the new technology can be realized when the knowledge barriers and knowledge burden are lowered (Purvis et al., 2001; Attewell 1992; Fichman and Kemerer, 1997). Indeed, it has been shown that most information technologies exhibit an "assimilation gap". This phenomenon occurs when the rate of the organization's assimilation and deployment of the technology lags behind the technology adoption rate (Fichman and Kemerer, 1999). One of the main advanced reasons of this gap is the high knowledge barriers. This gap between the firm's current state of knowledge and the required knowledge to effectively deploy the new technology should be, therefore, minimized (Teo et al., 2006) .This can be realized through several institutional mechanisms internally (for instance through training, incentives etc.) and externally through the supply-side institutions which supply the technologies (for instance technology vendors, service firms and consultants) which can help transferring and lowering the barriers of knowledge (Attewell, 1992; Fichman, 1992).

3.4. ERP Post-Implementation and Assimilation Previous Works

Most of the studies which used the diffusion theory have mainly investigated the adoption antecedents and little has been done when it comes to the post-implementation assimilation process. Most researchers who identified ERP projects success factors primarily focused on the pre-implementation and the implementation stages (e.g. Verville and Halingten, 2002; Kumar et al., 2003; Umble et al., 2003). Other researchers suggested success factors for all the ERP life stages (e.g. Nah et al., 2003, 2006; Mabert et al., 2003; Zhang et al., 2005).

These studies provide interesting insights about the ERP implementation stages. However, when it comes to the operation or post-implementations stage, except for vendor support, the identified factors were all internal and mostly technical. When it comes to studies limited to the post-implementation stage, very little research has been made. Stratman and Roth (2002) identified eight organizational competences to manage ERP post-implementation stages. Markus et al. (2000) identified the problems encountered in the different ERP life cycle stages and suggested some success measures for each stage. Nicolaou (2004) suggested that a set of planned review activities, contribute to the success of the post-implementation success in ERP systems. In a later research, Nicolaou and Bhattacharya (2006) assert that, over a post-implementation time frame, early enhancements and developments of the system might enjoy superior financial performance in comparison to other ERP-adopting firms. In another study, Beard and Sumner (2004) concur that post-implementation alignment of the ERP system with the company's strategic direction, in addition to careful planning, management and process reengineering during implementation, are key sources of competitive advantage for the adopting firm. Based on an analysis of ERP literature during the years 2003 and 2004, Botta-Genoulaz et al. (2005) support that strategic alignment and good use of the system are a requirement to ensure the development and the competitiveness of the company. Amoako-Gyampah and Salam

(2004) assert that positive attitudes and beliefs formed during implementation regarding ERP usefulness could significantly influence the system's acceptance in the company. Amoako-Gyampah (2007) supports these findings and suggests that managerial interventions aimed at increasing the users' perceptions of the usefulness of the system, through training, better communication and user involvement, results into more efficient use of the system. Similarly Calisir and Calisir (2004) concur that end user satisfaction could be influenced by the users' perceived ease of use and learnability. Wu and Wang (2006) focus on measuring user satisfaction evaluation. They argue the importance of the ERP products, contractor service and the users' knowledge and involvement in enhancing the system's acceptance. Based on an investigation of the post-implementation optimization efforts of several companies, Botta-Genoulaz and Millet (2005) conclude that better use of ERP systems result into new organizations and constant adaptation of the company's strategy. In an attempt to guide optimization efforts, the authors suggest a classification of ERP use for each of the operational tactical and strategic optimization stages. Our basic hypothesis in this study is that ERP assimilation is a requirement for the realization of the improved performance and the other expected tangible and intangible benefits.

While previous studies limited the external factors to vendors and consultant support, we take an extra step forward by considering an extra external influencing factor: the isomorphism pressures. Institutional pressures have been mainly considered to influence the adoption intention (e.g. Teo et al., 2003), the effect of these forces could extend also to other stages of the innovation adoption and assimilation process (Chatterjee et al., 2003; Gibbs and Kraemer, 2004). Hence, we posit that isomorphism forces influence the post-implementation stage of the ERP systems.

One other main contribution of this study is that many of the published researches fail to ground their hypotheses in existing theory. Our integration of the assimilation concept, the complex technological innovations diffusion and the institutional theory into a comprehensive model will provide a better understanding of the ERP assimilation process.

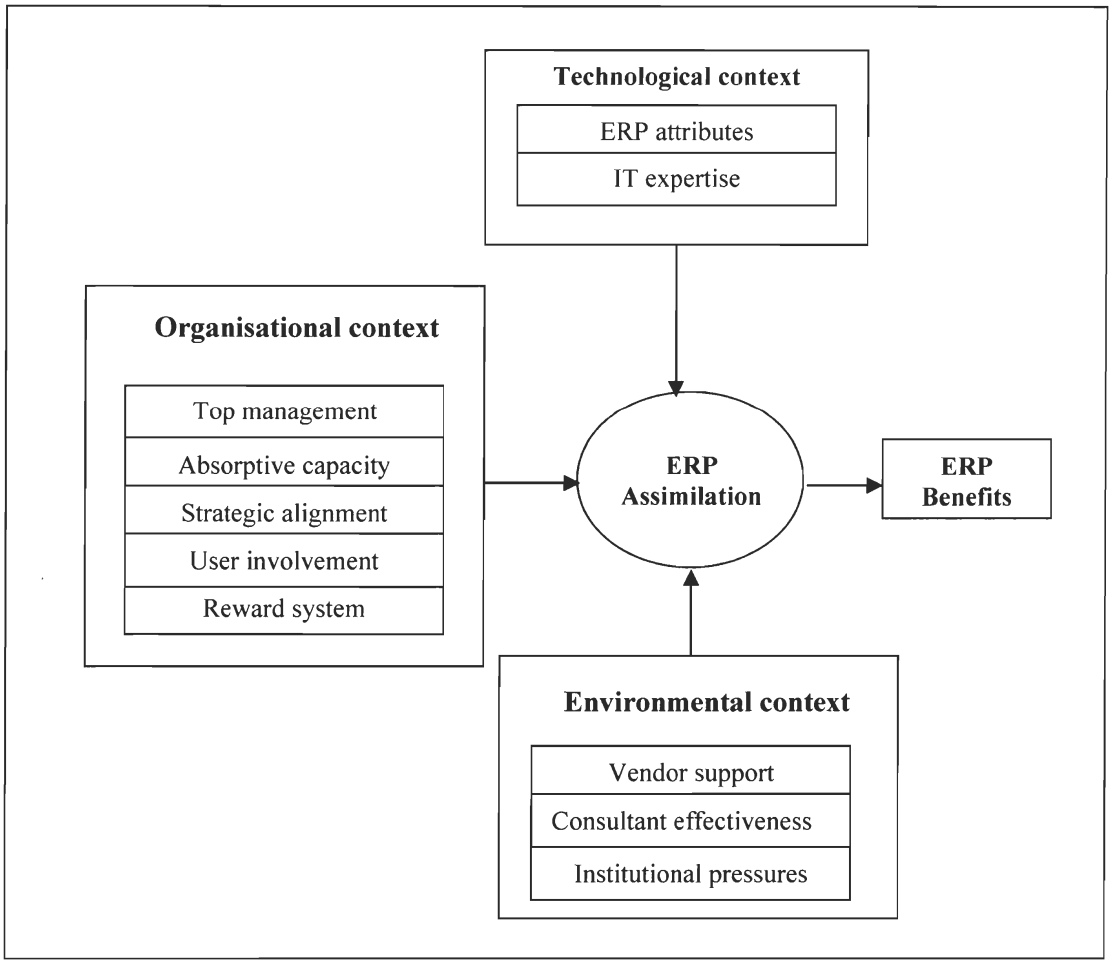
3.5. ERP Assimilation Context: TOE Framework

A meticulous review of the ERP implementation and assimilation literature would suggest that the technology-organization-environment (TOE) framework (Tornatzky and Fleischer, 1990) is an appropriate starting point to our research. The TOE framework considers three aspects of the firm's context which would determine the process by which a firm adopts, implements and assimilates technological innovations: a) the technological context defined in terms of the existing and the new technologies of the firm; b) the organizational context which includes several descriptive measures such as management structure, quality of its human resources, scope and size; c) the environmental context which refers to the external institutional environment including its industry, competitors, dealings with government and access to resources offered by others (Tornatzky and Fleischer, 1990, pp. 152–154).

The TOE framework has often been used to study the determinants of adoption of a technology (Gibbs and Kraemer, 2004; Zhu et al., 2006). The framework has also been useful in studying the determinants of technology usage, implementation and routinization (e.g. Zhu and Kraemer, 2002; Zhu et al., 2006). The TOE framework would be, therefore, appropriate to explore the factors which would determine ERP post-implementation assimilation.

Using this framework in conjunction with the complex technological innovations assimilation and the institutional theory will help us find the combination of variables that would be excellent predictors of ERP assimilation. The following figure illustrates the different sets of factors that we have chosen for our ERP assimilation model. Each factor is further detailed in the following sub-sections.

Figure 3-2 ERP Assimilation Framework



3.5.1. Technological Context

The technological context describes the characteristics of the innovation in question as well as the organization's internal technological landscape (Tornatzky and Fleischer, 1990). For the purpose of our research, we have considered: ERP attributes, and IT expertise.

3.5.1.1. ERP Attributes

The importance of innovation attributes has been strongly acknowledged in the innovation literature (Rogers, 1983). The system's quality significantly influences the end user's satisfaction and, by the same token, the degree of its assimilation. Moore and Benbasat (1991) argue that voluntariness, relative advantage, compatibility, personal image, ease of use, visibility and result demonstrability, influence the technological innovation diffusion and assimilation. In an attempt to measure user satisfaction with ERP systems, Somers et al. (2003) tested the 12-item end-user computing satisfaction instrument (EUCSI) developed by Doll and Torkzadeh (1988). These measure satisfaction with content, accuracy, format, timeliness, and ease of use. Similarly, Wu and Wang (2006) suggest that eleven ERP system characteristics are key factors in assessing user satisfaction. These are: ERP system information accuracy, timeliness, reliability, response time and completeness, output requirement (the layout design and flexibility of the output content), relevancy (the degree of congruence between user tasks and ERP functions), system stability, auditing and control (type of auditing rendered by the system), ease of use and usefulness of the system for the user.

Flexibility is another key characteristic of ERP systems and an essential requirement for the companies (Gupta and Kohli, 2006). ERP system should be flexible enough to support various business lines and organizational strategies in different industries (Gupta and Kohli, 2006). The system's parameters and codes can be defined, for instance, according to the business needs (Ahituv et al., 2002). An ERP should also enable the addition of modules (software segments) to support supplementary functions and business processes (Ahituv et al., 2002; Shehab et al., 2004). Furthermore, ERP systems could complement data processing and analysis when connected to other systems (Ahituv et al., 2002).

3.5.1.2. IT Expertise

Senior managers may not have a precise idea about their need for the system, its capabilities and how to implement it. They are, therefore, dependent on their IT department to better understand these issues. Since many ERP vendors disclaim the responsibility for hardware and network infrastructure, the internal IS memories should have the required expertise to provide a reliable infrastructure (Grossman and Walsh, 2004). Moreover, once the implementation process is over, the IT department would be responsible for debugging and trouble shooting the system, continuously refining and adjusting it to the evolving business needs and retraining users (Stratman and Roth, 2002 ; Kumar et al., 2003).

3.5.2. Organizational Context

The organizational context represents the different mechanisms, structures and characteristics that influence the propensity of adoption and assimilation of an innovation (Tornatzky and Fleischer, 1990). The organizational attributes include: top management championship, absorptive capacity, strategic alignment, user involvement and reward system.

3.5.2.1. Top Management Championship

Top management championship has been consistently found to be one of the most critical factors both in IT implementation and innovation studies (Ramamurthy et al., 1999; Purvis et al., 2001). It refers to the extent that top management supports, directly and indirectly, and commits to the continuous use of the ERP. Research has even shown that it is the most predictive factor of the ERP project success (Somers and Nelson, 2004). Top management involvement and their sustained support throughout all the phases of the project help ensuring a smooth change management and mobilizing commitment of other stakeholders (Bingi et al., 1999; Al-Mashari et al., 2003; Somers and Nelson, 2004).

Since the beginning of the project, it is incumbent upon the organizations to clarify the reasons of their system's adoption so that they do not fall into mere reactionism to their competitors (Davenport, 1998). Throughout the project, senior management needs to constantly monitor and direct the project teams (resolving conflicts, communicating strategic goals and team achievements etc.) (Nah et al., 2003; Umble et al., 2003; Somers and Nelson, 2004; Zhang et al., 2005). At the end of the project, top management needs to encourage system usage and commitment of use. Their commitment is also crucial for the post-implementation stage especially when it comes to providing the essential resources for maintenance and upgrades and implementation in other units and departments.

3.5.2.2. Absorptive Capacity

Among the post-implementation stage problems, Markus et al. (2000) have particularly cited the lack of improvement in users' ERP skill levels and the shortage in documenting the rationale for business rules and configuration decisions. As a matter of fact, they have argued that, in many cases, a considerable number of potential users remain untrained, which keeps them dependent on the project team and the IT personnel while performing their normal jobs. Both issues reflect, in fact, a lack of learning readiness in the organization.

Cohen and Levinthal (1990) define the absorptive capacity as the firm's ability to appreciate an innovation, to assimilate and to apply it to new ends. A firm's absorptive capacity includes two main components: its prior relevant knowledge, and its investments in acquiring new knowledge (Ravichandran, 2005).

Being a complex technology, ERP imposes a heavy learning burden on novel users in terms of understanding the system, and learning how to use it (Ke and Wei, 2006). Cohen and Levinthal (1990) stress that the firm's absorptive capacity is, in fact, largely a result of the firm's pre-existing knowledge in areas related to the focal innovation. Hence, the more a firm possesses prior ERP related knowledge, the less arduous the assimilation process is (Cohen and Levinthal, 1990; Ke and Wei, 2006). Prior related knowledge includes previous experience with similar technologies, knowledge about the different functionalities and possibilities of the system, the required behavioral and managerial changes.

Complex technological innovations require, however, promoting the firm's learning skills. The firm needs for instance to be committed and open to learning and experimentation and to be ready to knowledge transfer (Jerez-Gómez et al., 2005). Commitment to learning implies that the organization provides the necessary resources for continuous learning (Jerez-Gómez et al., 2005). This includes putting in place certain procedures to capture, codify and disseminate ERP knowledge by individuals (technical specialists, consultants, ERP competence centers, etc.) and tools (manuals, databases, files, organizational routines, etc.) in order to ensure that what has been learned in past situations remains valid. Training, linkages to mediating institutions (user groups, standard setting bodies, universities etc.) would enrich the firm's technology related knowledge including its expectations and perceptions about the technology (Ravichandran, 2005).

3.5.2.3. Strategic Alignment

The importance of the strategic alignment of IS is still generating a debate over the ways of realizing that goal (Hirschheim and Sabherwal, 2001; Sabherwal and Chan, 2001; Bergeron et al., 2004). It has been argued that increased performance requires the whole system's element co-alignment and integration (Bergeron et al., 2004). Differently stated, when a change occurs in the internal or external business environment, resultant inter-

linked changes at the (business sand IT) strategic level and operational level (business and IT structure) are required (Bergeron et al., 2004). Based on this perspective, the fit of ERP systems (which are part of the IT infrastructure), business strategy, IT strategy and organizational structure are crucial to holding up the hypothesis that value and improved performance from ERP investments is achieved through simultaneous adjustments and alignment in the business environment.

3.5.2.4. User Involvement

User involvement refers to the psychological engagement of users with the resultant IS product of that development process (Barki and Hartwick, 1989). It has been advocated in IS implementation for it increases user satisfaction and acceptance by: developing realistic expectations about system capabilities, providing an arena for bargaining and conflict resolution about design issues, leading to system ownership by users, decreasing user resistance to change and committing users to the system (Ives et al., 1983). In the case of ERP system, user participation since the early stages of ERP adoption helps in recognizing the particular needs and difficulties that the users encounter. Ignoring the users' needs increase the risk of resistance and rejection of the system (Markus et al., 2000). Low user satisfaction with systems which do not satisfy their need is another risk which could increase resistance and turnover (Kumar et al., 2003). User participation for managers can represent a tool of "appeasement" and control for managers. It helps them identify the possible difficulties of the ERP initiative (Kawalek and Wood-Harper, 2002). It is, on the other hand, a reassuring and empowering tool for users. By seeing their voice being valued, users are more confident that the system is made for them and become more open to accept it (Kawalek and Wood-Harper, 2002).

3.5.2.5. Reward System

According to the expectancy theory, an individual's intention to perform an action is partly determined by consequence expectations (Cabrera et al., 2006). There has been evidence that reward strategies such as rewarding the acquisition of new skills, linking compensation to company profits and other strategies promote learning in the company (Jerez-Gomez et al., 2005). By rewarding certain behaviors, compensation strategies aim at institutionalizing these behaviors so that they become predominant. Researches have shown that when individuals believe that training, for instance, will result in positive rewards and recognition, they are more likely to pursue voluntary training and development actions (Jerez-Gomez et al., 2005).

One other major advantage of rewards and compensations is that they significantly contribute in employee retention (Jerez-Gomez et al., 2005). In the case of ERP systems, it is common that the firm invests in a team of its employees, or super-users in order to manage the system. These are usually high skilled people who know very well their firm's business processes, have the expertise in the firm's system and in managing change (Hare, 2004). Since they will be dealing with several parties in the firm, they usually possess also strong interpersonal skills. It is in the firm's interest to retain these people, through reward systems, and to preserve the rich knowledge repository that they possess for the firm's benefit.

3.5.3. Environmental Context

3.5.3.1. Institutional Pressures

The Institutional Theory argues that organizational structure and actions are influenced by the institutional environments (Scott, 1995). According to it, organizational

decisions are mainly made to legitimize themselves in their external environment and not purely to increase their efficiency (DiMaggio and Powell, 1983). The institutional theory postulates that institutionalization occurs when organizations face several pressures (like competing for resources, customers, political power, social and economic fitness) which push them to be isomorphic with their environment (DiMaggio and Powell, 1983; Teo et al., 2003). These pressures towards institutional isomorphism are described by DiMaggio and Powell (1983) as mimetic, coercive and normative forces.

Mimetic pressures force firms, especially under conditions of uncertainty, to imitate other structurally equivalent firms, mainly successful ones (DiMaggio and Powell, 1983). Mimetic pressures could help the firm to acquire legitimacy and prestige, to save on experimentation costs and on human actions (Teo et al., 2003). Because of the high risks and the associated costs of ERP systems initiatives, firms would tend to copy successful players in their industry.

Coercive pressures are the external pressures exerted by resource-dominant organizations (dominant suppliers and customers) and regulatory agencies and legislative bodies (DiMaggio and Powell, 1983; Teo et al., 2003). In the case of ERP systems, coercive pressures might emerge from dominant suppliers and customers who require higher quality service and more efficient operations.

Normative pressures are exerted by professional communities and professional standards (DiMaggio and Powell, 1983). In the case of ERP systems, normative pressures could emerge through ERP user group communities, professional agencies, conferences, training and other professional events. These would allow the sharing experiences between firms, learning about new functionalities, features, improvements, system gaps, lacunas etc. Because of the evolutionary nature of ERP systems, the influence of normative pressures could hardly be avoided.

3.5.3.2. Consultants Effectiveness

Studying the relationship between the consulting services and the implementing organization is of great importance in ERP projects. ERP projects are socially and technically complex projects. Although ERP systems are packaged software applications, consulting expenses represent the majority of project cost (about 60%) (Hitt et al., 2002; Koch, 2002; Haines and Goodhue, 2003). Consultants' intervention can vary from purely technical assistance (setup, installation, and customization of the software) to change management and strategic project planning and management tasks (Haines and Goodhue, 2003).

Organizations should, therefore, carefully choose their consultants, even during the post-implementation stage, in order to benefit the maximum from their services. Consultants may have specific experiences in specific industries, comprehensive knowledge about certain modules and may be better able to determine which suite will work best for the company (Somers and Nelson, 2003). The rapid technological developments, however, and the lack of cumulative tradition, resulted in a shortage of fully qualified personnel who can advice to an organization in every single ERP module, particularly where integration, tools and interfaces with external partner products are concerned (Markus et al., 2000; Chang, 2004). For many organizations, the best solution would be to choose the consulting services based on reputation and credibility, and to trust that service provider to help them acquire the needed knowledge and expertise and transfer it to its users (Haines and Goodhue, 2003). It is very important to ensure the consultant's involvement and commitment to the organization in order to ensure their continuity with the assigned personnel in all phases of projects, including the post-implementation stage. When evaluating the consultant's involvement, Haines and Goodhue (2003) distinguish between the level of involvement reflecting the number of consultants working on the project and the length of their assignment and the roles that the consultant assumes. Indeed, among the reported problems of the consulting services are the quick turnover and the discontinuity of services (Markus et al., 2000). Other reported problems with IT consulting

services are the unwillingness of some of these services to take end-to-end responsibility for coordinating all parties (Markus et al., 2000) and their resentment to take subordinate roles to other firms. Problems of information asymmetry and lack of open communication are also prone to emerge between the implementer and the consulting service provider by fear of ceding authority to strangers (Markus et al., 2000). Consultants who perform strategic management tasks play an important role during all the stages of the project, while those whom perform technical tasks are less important in the final stages of the implementation project. Once the company becomes well adapted with the product, consultants' intervention would be still useful for implementing upgrades and new modules.

3.5.3.3. Vendor Support

The need for a strategic relationship between the ERP vendor and user organizations is unique and vital to ERP systems (Chang, 2004; Somers and Nelson, 2004). Research has shown that close fit between software vendor and the customer organization influences positively the packaged software implementation success (Janson and Subramanian, 1996). The vendor's chief role is to offer ongoing and timely support through the different stages of the ERP implementation life-cycle, including the post-adoption stage (Chang, 2004). In the early stages, the ERP vendor provides the customer organization with rapid implementation tools and technologies such as business process modeling, templates for industry specific business practices, bundling of server hardware with ERP software (Somers and Nelson, 2004). Not only do these tools and technologies reduce the time and costs of implementation but they are also "important for transferring knowledge about the use of the software, understanding the business processes within the organization and recognizing best practice" (Somers and Nelson, 2004). With the unceasing software developments, ERP systems require continuous investments in new modules and upgrades to improve their functionalities and to realize their strategic value (Somers and Nelson, 2004). Given their expertise with the software, the vendor's support in the form of technical

assistance, software updates, emergency maintenance, user training and recycling, and other support services, is judged to be very important for the system's success (Chang, 2004; Somers and Nelson, 2004).

3.6. ERP Benefits

Organizations' ultimate objective by investing in ERP systems is to reap the opportunities and benefits that they provide them with, once the system is implemented and routinized in the organization. These benefits are multidimensional: while some are quantifiable and/or tangible, many others are intangible and/or unquantifiable. ERP benefits could be classified into: operational, managerial, strategic, technological and organizational (Shang and Seddon, 2002; Raymond et al., 2006). Operational benefits are those which influence day to day activities. Benefits offered by ERP systems include: cycle time reduction, productivity improvement, customer service improvement. At the managerial level, the centralized databases, timely information and built-in data analysis capabilities improve decision making, planning and resource management of the different business divisions (Shang and Seddon, 2002; Mabert et al., 2003). By integrating the company's information and providing the opportunity to better understand the business processes, users' communication improves which helps them to develop a shared vision of the business. These organizational advantages in addition to the interconnectivity and the ability of establishing extended tight links with customers and external partners provide ERP adopting firms with valuable strategic advantages (Shang and Seddon, 2002).

3.7. Conclusion

Throughout this article, we have tried to develop a systematic account of ERP assimilation which could be useful in guiding ERP adoption initiatives and research. Our

research model's integrated approach and the robust theory, on which we have based our hypothesis, will be very helpful in the identification and amplification of the factors influencing ERP assimilation. This is significantly true for the ERP system's assimilation impacts on the realization of the system's advantages. Indeed, despite the abundance of ERP literature, the existing research has been lacking the explicatory theoretical base.

The validation of the framework has already started. A qualitative methodology has been adopted in order to test and refine our model. Six case studies of manufacturing companies that went through the experience of implementing ERP systems and that are at the post-implementation stage are to be explored. These companies belong to different industries, including the agriculture and the forest industries. A feasibility study has been realized in three companies operating in the furniture, fiber-optics and the tobacco industries.

The results of our research will provide guidance to managers, IT professionals and consultants concerning the contextual factors which can influence positively the realization of the aspired for benefits of ERP systems. They will also provide insight for the factors which are most problematic and most critical for the system's assimilation and long-term success in the organization. Finally, our research will also allow traditional industries such as the forest products industry to learn from more experienced industries.

CHAPTER 4 – Investigating the Determinants of Effective Enterprise Planning Assimilation: A Cross-Case Analysis

4.1. Introduction

Since their emergence, enterprise resource planning (ERP) systems have been promoted as a critical technology in a growingly complex and knowledge-intensive economy. It has been argued that, if properly planned, implemented and assimilated, ERP can significantly improve information flow and streamline internal processes, therefore developing the firm's efficiency and its competitive advantage (Goyal and Randhawa, 2008). However, despite the large-scale adoption of enterprise systems and the concomitant momentum that these systems are gaining worldwide, attaining the expected benefits is still a challenging task. Several ERP implementations have not lived up to their adopters' expectations, and stories of failure litter the ERP landscape. Reasons for ERP project failures included the wrong choice of software, the inappropriate timing of the project, improper planning and implementation, the lack of resources (material and human), resistance to change and inconsistent management support (Morton and Hu, 2008, Vlachopoulou and Manthou, 2006). Despite their importance, issues related to the post-implementation stage have not been sufficiently addressed in the literature (Botta-Genoulaz et al., 2005; Nicolaou and Bhattacharya, 2006). The underutilization and rejection of the system are but a few symptoms of more serious problems that must be addressed during the post-implementation stage (Botta-Genoulaz et al., 2005). Although there has been growing

interest in this phase in the ERP's life cycle, there remains a need to investigate its various success factors. Hence, this study is partially motivated by the need to fill this research gap.

Among other benefits, ERP systems promise the improvement of the decision-making process by providing timely, accurate and integrated information (Kamhawi, 2008). There has been much debate about the ability of ERP systems to provide information in a format that would support the three main types of managerial activities, namely strategic planning, management control and operational control) (Carton and Adam, 2005). ERP vendors claim, however, that their products are indeed designed to support different types of decisions with different levels of complexity, different time horizons and different geographical dispersions (Kamhawi, 2008). Little research has been realized on the impact of ERP systems on managerial activities. Therefore, another objective of this study is to investigate the degree of support of ERP systems for the three categories of managerial activities. The purpose of this study is therefore to understand and to investigate the determinants that facilitate the assimilation process of ERP systems in a company during the post-implementation stage in terms of the level of deployment of the system and its support of managerial activities.

Tornatzky and Fleisher (1990) suggested that the external environment, the organizational context, and the technological context were related to the failure or success of information systems (IS) applications. ERP literature (e.g. Musaji, 2005, Kamhawi, 2008) has also emphasized the importance of contingency factors in ERP implementation and benefit realization. In this paper, therefore, we focus on a set of technological, organizational and environmental factors that were suggested to be important for assimilation and the ERP post-implementation stage.

Through the use of case studies and based on an extensive review of the literature, this paper aims to answer the following research questions:

- What determinants could explain the variation in ERP assimilation among firms?
- To what extent are ERP systems used to support the different managerial activities of a firm?

The remainder of this paper is organized as follows: first, we present the assimilation concept; next, we explain our research methodology; and finally, we present the experiences of three Canadian manufacturing companies, followed by a discussion highlighting our main findings and lessons learned.

4.2. The Concept of Assimilation

ERP software embeds a set of industry best practices that are incorporated as standard work procedures (Benders et al., 2006; Wang et al., 2006). This contradicts the competitive advantage objective because these best practices are equally available to other competitors that adopt the same system (Beard and Sumner, 2004; Benders et al., 2006). Achieving the competitive lead therefore requires the full assimilation of the adopted ERP and the deployment of its features in a way that would maximize the resulting benefits (Benders et al., 2006). Ranganathan et al. (2004) define assimilation as "the extent to which the use of technology permeates organizational work processes and activities." For Rai et al. (2006), assimilation describes the evolution of an organization, from understanding the technology to utilizing it in its main activities. In their diffusion stage model, Cooper and Zmud (1990) identified six stages of the IS implementation process. These stages are: initiation, adoption, adaptation, acceptance, routinization and infusion. The last three post-implementation stages represent three different levels of IS assimilation. Acceptance denotes the stage at which users are encouraged to commit to the new technology. During routinization, the system becomes institutionalized in the company and is no longer perceived as out of the ordinary. At the infusion stage, the system is deeply and

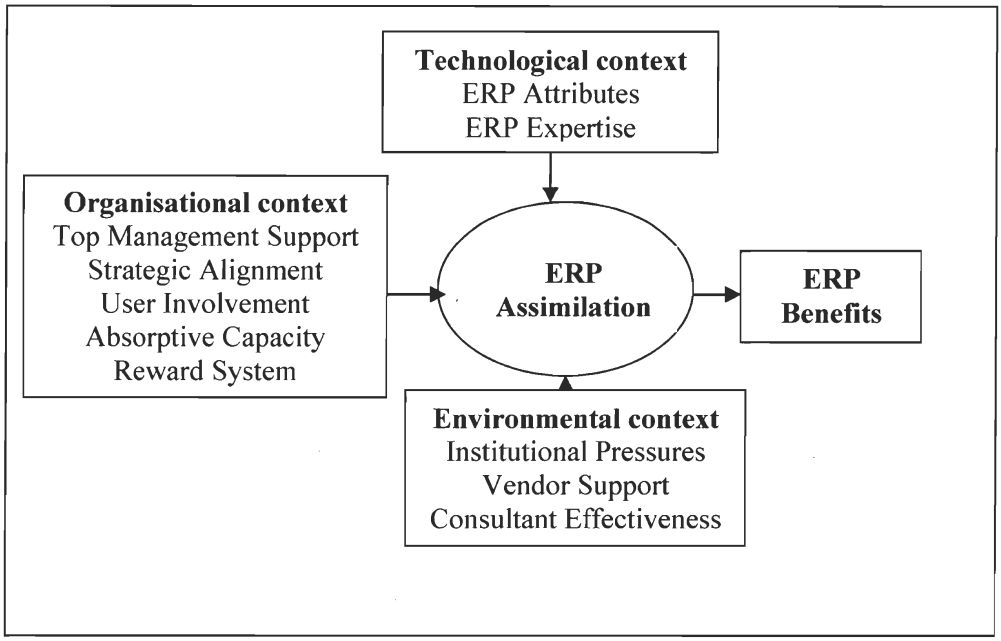
comprehensively embedded within the firm's work systems. With the accumulated learning that takes place in prior stages and the direct experience they have with the IS, users might start to use the system in a more sophisticated and comprehensive way. They do not only utilize more of the system's features, but they also, in some cases, try to experiment with the system and extend its features in order to accomplish more tasks (Saga and Zmud, 1994). Botta-Genoulaz and Millet (2005) also suggest three main stages of the optimization of ERP use based on software mastery and strategy deployment. The first stage is operational optimization, which aims to improve the system mastery in order to control the existing data. Tactical optimization, the second stage, aims to improve the system use for better control of the firm's operational processes. During the last stage, defined as strategic optimization, the system evolves to become a valuable support for the company's strategy. This is realized through several actions, such as the implementation of version upgrades and application mapping, and the development of business intelligence systems.

In our research, assimilation is defined by two main variables: the degree of deployment of the various features and functionalities of the system, and the degree of support to the firm's managerial activities.

4.3. Research Framework

Drawing on the ERP implementation and IS assimilation literature, we focused on factors within the three main contexts that could influence the ERP assimilation process: the technological context factors, the organizational context factors, and the environmental context factors. The following figure illustrates the framework that guided our research:

Figure 4-1 Research Framework



4.4. Technological context factors

4.4.1. ERP attributes

ERP attributes, such as perceived usefulness, ease of use, reliability, accuracy, timeliness, and flexibility, affect users' satisfaction and their level of use of the system (Wu and Wang, 2006; Hsieh and Wang, 2007; Amoako-Gyampah, 2007). The system attributes have more impact on user satisfaction once the project is completed than during the system configuration and implementation. Once the ERP is installed, users start to discover its

features, strengths, and weaknesses (Musaji, 2005). Depending on their satisfaction with the system, users are either encouraged or discouraged to make further use of the system.

4.4.2. IT expertise

IT expertise refers to the ability to support users and managers to properly utilize the system by providing the required maintenance, refinement, and adjustments. Many of the ERP system's challenging issues emerge once the system installation is completed and the ERP team is disbanded (Musaji, 2005). For instance, decision-makers could face problems when they follow a course of action that is different from the configuration decisions that were made during the implementation stage (Carton and Adam, 2005). IT members who understand the logic behind the configuration decisions are therefore required to assist decision-makers in better understanding the information they have and their work processes (Carton and Adam, 2005).

4.5. Organizational context factors

4.5.1. Top management support

Unlike other IS projects, an ERP project should be perceived as an ongoing business project requiring appropriate financial, human, and technical support. ERP projects are complex initiatives that lead to major changes that are mostly felt when users start working with the system. The support of top management to promote system assimilation, however, can only be effective if it is convinced of the system's strategic value and usefulness. Top management conveys its perceptions about the risks and opportunities of the technology to managers and business units (Ramayah et al., 2007, Chatterjee et al. 2002) suggest that. These perceptions can shape people's assimilation level of the system (Thomas and Huq, 2007).

4.5.2. Strategic alignment

The lack of close integration between IT strategy and business strategy could risk a company's performance and competitive ability (Rathman et al., 2005). Most researchers who considered ERP alignment (e.g. Somers and Nelson, 2003 and Ho et al., 2004) concentrate on alignment strategies that should be used primarily during ERP implementation. Owing to the integrative and evolutionary nature of ERP systems, achieving a strategic fit between the product and the organization is an ongoing activity that should continuously be monitored in order to avoid alignment gaps (Wang et al., 2006).

4.5.3. User involvement

The integrative nature of ERP systems very often presents a perceived threat to users' control over their work and "their" information, resulting in their rejection of the system. This partially explains the considerable problems of user resistance and lack of system buy-in that several companies experience during ERP projects (Barker and Frolick, 2003; Howcroft and Light, 2006). Companies must therefore understand how and when user involvement should be promoted to ensure long-term ERP assimilation success (Wagner and Newell, 2007). Unlike other IS projects, ERP users cannot be involved during the early design stages because the software was already designed to serve a particular group of users. ERP user involvement has been argued to be more beneficial during the post-implementation stage. When users start to work with the system, they begin to understand its functionalities and to explore its possibilities and limits (Wu and Wang, 2006). They become therefore better equipped to describe their needs and to demand adjustments to satisfy their requirements. Furthermore, the earlier the suggested changes are made, the better users' needs are met and the more they get involved to better utilize the system to fulfil more sophisticated requirements (Musaji, 2005; Wagner and Newell, 2007).

4.5.4. Absorptive capacity

Absorptive capacity refers to a firm's ability to identify, acquire, and assimilate new knowledge (Cohen and Levinthal, 1990). A firm's absorptive capacity includes two main components: its prior relevant knowledge, and its investments in acquiring and assimilating new knowledge (Ravichandran, 2005). Hence, firms with previous experience with an ERP system are likely to have gained insights about the effective use and assimilation of such systems. Similarly, firms that allocate the appropriate resources to acquire ERP knowledge, mainly through training, are in a better position to facilitate assimilation and system mastery (Rajagopalan et al., 2007). Nah and Delgado (2006) argue that post-implementation training and retraining programs are just as important as the implementation stage, if not more.

4.5.5. Reward system

Research studies that consider the reward system structure as a predictor of innovation diffusion are very few. The link between reward strategies, learning improvement, and the institutionalization of favourable behaviours has, however, been established in the literature (Jerez-Gómez et al., 2005). ERP implementation literature has also stressed the importance of appropriate incentive systems and focused performance measures that would encourage system deployment (Finney and Corbett, 2007). Moreover, it is common that once the system installation is complete, the ERP project team is disbanded (Musaji, 2005). The major problem that firms face is the quick turnover of trained super-users and internal IT experts who are knowledgeable about ERP (Finney and Corbett, 2007). While there may be several reasons for this loss of human resources, financial reasons are also an important factor that could encourage them to leave. By offering the appropriate rewards and incentives, ERP expertise could be retained, hence providing users with the appropriate support that would help them to better assimilate the system.

4.6. Environmental context factors

4.6.1. Institutional pressures

According to the Institutional Theory, organizations are influenced by their institutional environment, and their decisions are made not only to increase their efficiency but also to legitimize themselves in their external environment (DiMaggio and Powell, 1983). These pressures are described by DiMaggio and Powell (1983) as mimetic, coercive, and normative forces. Mimetic forces are the firm's response to uncertainty by mimicking the choices of other organizations (often the leading competitor) that they believe have made the appropriate decisions (Teo et al., 2003). Coercive forces are exerted by resource-dominant organizations (dominant suppliers and customers), regulatory agencies, and legislative bodies (DiMaggio and Powell, 1983; Teo et al., 2003). Normative pressures result from professional communities and professional standards that could directly or indirectly force the firm to assimilate the system. In the case of ERP adopting firms, mimetic and coercive forces could promote the use of new modules and functions to support higher-level decisions. Because of the evolutionary nature of ERP systems, normative pressures that tend to emerge through ERP user group communities, professional agencies, conferences and other professional events could hardly be avoided.

4.6.2. Vendor support

It has been argued in previous research that there is a vital need for a strategic relationship between the ERP vendor and user organization (Somers and Nelson, 2004; Chang, 2004). The vendor's chief role is to offer ongoing and timely support throughout the various stages of the ERP project life-cycle (Chang, 2004). During the implementation stage, the ERP vendor provides the customer organization with rapid implementation tools and technologies (Somers and Nelson, 2004). Since ERP is an evolving technology, continuous investments are required (upgrades, new modules, etc.). Given that vendors are

knowledgeable about their customers' business, processes, and requirements, they are well equipped to serve the firm's needs. Vendor support, which can include technical assistance, software updates, emergency maintenance, user training and other support services, is judged to be very important for implementation success (Chang, 2004; Somers and Nelson, 2004).

4.6.3. Consultant effectiveness

Although ERP consultants intervene primarily during the implementation stage, they can also be of great help during the post-implementation stage. This is mainly when new functionalities are to be deployed or new modules are to be implemented. In spite of the increasing number of ERP consulting services, there are still problems with the quality and effectiveness of consultants (Markus et al., 2000). Indeed, among the reported problems of consulting services are quick turnover, the discontinuation of services as well as problems of information asymmetry and lack of open communication due to the fear of ceding authority to strangers (Markus et al., 2000).

4.7. Research Methodology

When behavioural events cannot be adequately controlled and when little is known about a phenomenon due to the lack of theory about it, a qualitative approach such as the case study method is highly recommended as a means to gather evidence and understand complex phenomena (Yin, 2003; Eisenhardt, 1989; Stuart et al., 2002). There are several advantages to using the case study research method, such as studying a phenomenon in its natural setting, directly observing causality relationships, asking follow-up questions for more extensive, valid and rigorous findings and insights, and combining evidence and logic to build, develop or support theories that are not available using other research methods (Muscatello and Parente, 2006). ERP systems projects represent a major undertaking in a

firm, often involving all company departments and processes, requiring heavy investments of both time and money, and which could extend over periods ranging from months to years. All of these factors contribute to the complexity of the ERP systems initiative. Consequently, a quantitative methodology would not allow for an in-depth understanding of the firm's and the respondents' experiences with the system. Hence, we employed an inductive and largely exploratory approach using the case study strategy. We have, however, specified some factors and suggested a research method to guide us and help us shape a richer assimilation framework. Multiple cases were used in this research in order to improve the methodological rigour of the study through "strengthening the precision, the validity and stability of the findings" (Miles and Huberman, 1994).

A set of interview questions was developed based on the literature review and input from experienced professionals and practitioners. The interviews aimed at probing the interviewees about their firm's implementation project, and their experience with the ERP system and the ERP project. The bulk of the interview then focused on the importance and the impact of the suggested variables and on the identification of new variables that the interviewees perceived as necessary for a successful ERP assimilation. A pilot study was conducted in three manufacturing firms in order to validate the interview questions. The interviews were then carried out in three other manufacturing firms located in the province of Quebec. They were at different stages of post-implementation and had different levels of assimilation. The researcher and a research assistant, with good knowledge of ERP and other IT systems, conducted all the interviews. This allowed the cases to be viewed from different perspectives. Data was gathered primarily through in-depth, semi-structured interviews with at least five managers, including the operations/production manager, the marketing manager, the finance/accounting manager, the IT manager and a plant manager. This purposeful selection allowed us to gain detailed insights from both direct and indirect users of the system. Each interview lasted between 60 and 90 minutes, and was recorded and transcribed prior to analysis. The information obtained through the interviews was supplemented by information from internal and external organizational documents. The transcription reports were reviewed with the interviewees and the research assistant to

verify the convergence of the collected data. The data was then reduced to codes in categories that corresponded to the set of new and originally identified themes.

4.8. Case analysis

In the following sections, we document the actual assimilation experiences of the three manufacturing companies. We start by presenting an overview of their profiles that we summarize in Table 4-1, followed by a description of their implementation and post-implementation initiatives.

Table 4-1 Company A, Company B and Company C Profiles

Description component	Company A	Company B	Company C
Industry Sector	Cookie and cracker manufacturing	Moulded plastic products for several industries (food, chemical, forest products, petrochemical, etc.)	Manufacturing, marketing and distribution of lumber and wood-based value-added products, and the management of forest resources
Number of Employees	About 500	About 1000	About 2000
Sales *(as of Dec. 31st, '06)*	More than $200 million CAN	More than $200 million CAN	About $350 million CAN
Type of System Used	SAP	JD Edwards (JDE)	SAP
Implementation Date (go-live)	October 1997	December 2004	January 2002
Reason for System Selection	• Suitable for the firm's operations • "Felt" that SAP was the best solution for them	• Requires less people for support than other brands • Less complex than other systems • Satisfies the business needs	• Already used for the paper division • Has potential for customer service, accounting, operations, etc.
Motivating factors for Adopting ERP System	• Y2K problem • Clients' pressures • Need for a system that evolves with the firm's requirements • Detailed information for taxation	• Integration of the firm's financial data • Outdated manufacturing system • Need to integrate the firm's functionalities	• Need to standardize the financial and accounting systems of the division (headquarters and mills) • Need for a system that supports growth

Description component	Company A	Company B	Company C
Post-Implementation issues	• Sales manager still hostile to the system • Evening and night shifts lack appropriate support	• Lack of system understanding • Users lack IT and ERP proficiency • Heavy dependence on ERP/IT team • Heavy workload for the IT department • Use of parallel systems • ERP/IT expertise turnover • Employee turnover • Problems with data quality and integrity • Culture of financial support for product innovation and development vs. IT and business process innovations	• ERP/IT expertise turnover • Heavy workload for the IT team • Lack of system understanding • Heavy dependence on ERP/IT team • ERP/IT expertise turnover • Employee turnover (extra training costs for new employees) Lack of users' buy-in
Current Situation of the Company	• Leading position in its industry: ERP perceived as vital for the firm; capital tool that helped achieving that success. • 90% of its capacity is exploited • Long-term planning using another system • Continues to expand its system with new modules and to deploy extra functionalities of the existing modules • ERP used for operational control	• Competitive position in the industry. It was planning to implement the ERP in the third plant and to implement the maintenance module. • Finance module is the best deployed module while operations are still experiencing problems • Just about 30 to 40% of the system capacities were used • ERP : firm's information backbone but just serves the transactional needs	• Lack of system understanding • The company had several problems with the implementation process that resulted in poor performance and user resistance • The level of employee satisfaction improved

Description component	Company A	Company B	Company C
Company Strengths	▪ Very effective change management during implementation and post-implementation ▪ Culture of openness to change, collaboration and cooperation ▪ Operations manager's high involvement with the system ▪ Highly competent IT team ▪ The company's size: medium vs. large	▪ The arrival of the new managers and the new CEO is improving the situation: better top management and manager support ▪ Strategic vision that integrates ERP ▪ Competent IT team trying to remedy the implementation project pitfalls ▪ The head of the IT team was the ERP project manager – an ERP consultant	• The new CEO : more supportive of the system • SAP centre of expertise • Competent IT team working hard on stabilizing the system
Major Benefits	▪ Strategic vision that integrates ERP ▪ Integrated, fast, and better quality information ▪ Integration of business processes ▪ Better process control ▪ Better decision-making ▪ Satisfying customer demands	• Integrated, fast, and better quality financial information • Normalized processes with several checkpoints • The integration of the different departments and plants of the company	• Major competitive advantage for the sales strategy (valuable information about several indicators) • Integrated, fast, and better quality information • Standardization of costs • Identification of problematic areas • Improved visibility of the division's operations • Improved decision-making

4.8.1 Company A

Company A is a medium-sized leading food processing company in Quebec with annual sales of about $220 million CAN and five production facilities. Its SAP/R3 system was implemented in 1998 using a Big Bang approach. Company A was among the very early adopters of an ERP in the industry. Tax changes, the Y2K problem, and the increasing requirements of their clients strongly encouraged Company A to adopt an ERP. All basic modules of the SAP/R3 were implemented in 1998. The consultant level of expertise was one of the major problems during implementation; the company had to terminate the contracts of several consultants because of their lack of expertise. The ERP project team comprised SAP/R3 consultants, the firm's CEO, the operations manager, the IT manager, the finance manager, and the marketing manager. The internal team, except for the marketing manager, was maintained after the installation was completed to form an ERP steering committee.

4.8.1.1. Implementation stage

During implementation, users were not comfortable with the system and resisted the change. Intensive (re)training and education sessions were designed during early post-implementation in order to help them to better understand the system, its functionalities, and their new or modified roles and responsibilities. The prevailing culture of cooperation and collaboration between employees at different seniority levels as well as the "one family" atmosphere in the company significantly helped users cope with the change and accept the system. The firm was also generally open to technological innovations and innovations. Users were open to learn, which significantly facilitated change management. Most of the firm's managers and employees were actively engaged in learning the system's functionalities. Their suggestions and requirements for change were discussed during ERP steering committee meetings and were prioritized depending on their level of importance. Managers with high IT competence, such as the operations manager, were remarkably

involved in further developing the system. The sales manager, on the other hand, was much less comfortable with IT in general and with ERP use. In order to cope with this issue, the information he required was manipulated in a way that allowed him to work the way he always did before introducing the system.

4.8.1.2. Post-implementation stage

Early post-implementation efforts aimed at improving system use through extensive training to better understand the system's functionalities and usefulness. Other post-implementation activities included improving the system's operation by correcting the identified deficiencies and using new functionalities of the existing modules. Later post-implementation activities included the system's expansion by adding new modules, such as business warehouse and project management, technical upgrades, and deeper usage of the system's modules. In the same vein, the firm initiated a project in 2007 to build a cockpit for each department to allow each manager to quickly get a view of the key performance indicators and other decision-making clues.

Even though the system has been implemented for about 10 years, the ERP system at Company A was not directly used to make strategic decisions. Likewise, planning decisions are made outside the ERP system, as the operations manager considered it to be "*too complicated compared to the other software that they use.*" It is important to stress, however, that the basic source of data for both the strategic and planning decisions is the ERP system. Control decisions, on the other hand are partially made with the ERP system but the system' transactional data remain the basic source of data for decisions. The operations manager pointed out that the heavy information load produced by the ERP systems can be confusing at a certain point. In order to solve this problem, considerable programming is required. He also suggested that a more user-friendly web interface could be useful for the manager's decision-making.

Company A's top management was consistently involved in person from the early stages of the system's life cycle. They constantly provided the required moral and financial support to improve the system and maximize its advantages. All respondents stressed the fact that there was never a blockage when it came to financial resources. The involvement of both top management and the managers positively affected users' involvement and commitment to the system. Users and managers continuously provided feedback and suggestions to improve the system to better serve their needs. When new decisions needed to be made about the system's evolution or changes, the ERP steering committee would meet in order to discuss the actions to be taken. Even though the firm no longer deals with the initial system vendor, the firm successfully receives the required support to improve its system. This support was provided internally by the "*excellent, very competent and skilled*" IT team and externally by ERP consultants. The IT team expertise was continuously updated through SAP training sessions and local and international ERP conferences.

The early ERP adoption provided the company with a competitive advantage in its industry. It was also able to grow and expand its activities while preserving almost the same number of employees. Nevertheless, as more competitors were adopting ERP, Company A felt that they "*lost what used to be a competitive advantage.*" Possessing an ERP system was no longer a sign of prestige. Moreover, there were increasing clients' and competitors' pressures and evolving norms of ERP usage that pushed it to further improve its performance. Because of these conditions, Company A realized that it had no choice but to make the most of the system and to make extra moves forward. As the operations manager maintained, "*...benefiting from all the advantages of all the functionalities is surely an advantage, but (we) have also to set off with innovations in this field. We have to be open to new functionalities ...We should go more forward...If we don't do that we will be outdistanced.*"

It is worth noting, however, that in spite of the valuable and wealthy ERP support, evening and night shifts still represent "*a major weakness*" for the firm's ERP. This was because firstly, these employees were much less experienced and received less training than their day-shift colleagues. Secondly, the evening and night shifts started in the evening "*when the experienced and competent resources (for ERP support) leave the company (when their workday ends)*" In order to repair this problem, ERP support resources were made available by phone and occasionally provided onsite assistance in the evening. The operations manager argues, however, that evening and night shifts still required more support if an overall appropriate level of assimilation was to be reached.

4.8.2. Company B

Company B is one of the leading North American producers of plastic products, with annual sales exceeding $200 million CAN. It operates in four facilities in Canada and has a network of sales offices and warehouses in Canada and the United States. The company manufactures over 200 products that are marketed to several industries including food, chemical, forest products, and petrochemical. Prior to implementing ERP, Company B had three separate systems; one of them was the main manufacturing system. As part of a bigger project of continuous improvement, Company B decided to implement a single integrated system primarily to serve the needs of the finance department by standardizing data across the company. Moreover, the old manufacturing system was no longer supported by its vendor. The ERP project started in February 2004 with the help of outside consultants. In December 2004, and following a Big Bang approach, the two Quebec plants switched to the ERP system. One year later, the system was implemented in another plant. The ERP system was planned for the third plant in Quebec two months later, but the project was postponed to September 2007.

4.8.2.1. Implementation stage

The firm experienced several problems during the implementation process. First, as the ERP project was being realized, the firm underwent a major rationalization process. Also, major changes were made in the ERP project's scope and business process definitions. In addition, the project lacked the appropriate support of top management, who considered the project as a low-priority IS project. For that reason, top management did not, for instance, encourage freeing key users to work on the project or allocate time for the project. According to the operations manager, the lack of top management support was partly due to the fact that "*the firm's organizational culture encourage(d) product development rather than innovations in business processes...they were not aware that business processes were fundamental for operational effectiveness...and that an ERP was the best system to realize that objective.*" As the project schedule got tight, the project team was pressured to terminate the project. In order to avoid major cost overruns, several important activities such as testing and training were restricted. The hasty go-live resulted in several problems, such as user resistance and dissatisfaction with the system's performance and outputs.

4.8.2.2. Post-implementation stage

In 2006, a new CEO and six new managers joined the firm, with most of them already having had experience with ERP. At the time the interviews were conducted (2007), the company was stabilizing its system and fixing the implementation stage problems. The use of parallel systems, information redundancy, and user dissatisfaction were widespread in the firm. As argued by several respondents, dissatisfaction was mainly due to the fact that several managers and users had very high expectations of the system, and the information they received about it during the implementation process reflected neither its limitations nor its real capabilities. Once they started using it, they were disappointed by its performance and outputs, which did not meet their expectations. Many of those who were frustrated with the system left the company. Those who were still

sceptical about it preferred to bypass it by working with their own applications, using Microsoft Excel for instance. The operations manager comments: "*There is a continuous comparison between JDE's reports and Excel's reports. In case of divergence, Excel's reports are given the priority over JDE's.*" These problems, as explained by our respondents, were due to the lack of training, education, and appropriate system testing, all of which resulted from the "*hasty go-live*". The IT manager argued that the post-implementation costs of errors, troubleshooting, extra time spent with users for support, and the increased dependence of the latter on the IT people could have been avoided if the go-live was delayed by at least one month. He added: "*computer literacy plays an enormous role in the successful assimilation of the system followed by (change management) and the learning capacity of people (users and managers).*"

Convinced of the potential of the ERP system, the new CEO wanted to provide moral and financial support in order to improve the system's assimilation level in the firm. One respondent reported that "*among the very first things that the new CEO said when he took his position is that they have spent about $4 million on JDE and that JDE is to stay and to operate successfully.*" The arrival of the new managers who had previously worked with ERP systems also had a major impact on the project's advancement due to their demonstrated support for the system. The IT manager and project leader asserted: "*I asked for resources, I had them...when I need people (to train) ...I talk to the manager and just one week later the person is freed*". Training and technical support was mainly provided by the IT unit. The former ERP project manager was the head of the IT unit that serves the whole firm. When a new module was to be implemented, consultants were recruited or were provided by the module's vendor. A steering committee including the firm's managers and the ERP project leader (and IT manager) met on a monthly basis to discuss the suggested improvements, upgrades, and changes. Company B's respondents argued that the IT team members were very competent and professional. However, their work overload could affect their performance. The high turnover rate of ERP experts and other IT specialists, the overdependence of users on ERP experts, the multiple projects that they had to work on (upgrades, new modules, revising business processes, programming and

configuration, training new employees, retraining users, etc.) were among the reasons that affected their level of support. Moreover, several super-users, who were previously trained and who had good knowledge of their department's modules, had either left or changed their position in the firm.

Even though the system was satisfying most of the finance department's needs, it was only responding to 30 to 40% of the operations department's requirements. The operations manager argued that this was because the first objective of the ERP implementation was to standardize and centralize the financial information with the hope that other advantages would be felt in other departments. He added that the unclear vision of the ERP project and the lack of involvement of ERP users led to the low level of ERP deployment. System use was limited to the operational level and did not improve since the ERP was installed. Other systems were, therefore, required for the planning and strategic decisions. As argued by several respondents, operational effectiveness and competitive forces were among the main external factors that push the company to improve its ERP assimilation. Some of the clients had special requirements about the exchanged data quality and timeliness. Moreover, since the events of 9/11, new regulations have been administered by customs, which require detailed and timely reports and specific types of information. Using the ERP system helped Company B provide the required information on time and with the required details.

4.8.3. Company C

Company C is a division of a North American leader in the design and manufacturing of different types of paper (e.g. commercial printing, publication, technical, etc.). It offers several types of lumber and its co-products, such as wood chips, sawdust, and shavings. An ERP system (an SAP ERP system) was implemented in another division in 1996. Company C's project started in 2001 and went live in January 2002. By adopting an ERP, Company C aimed at standardizing the financial and accounting systems, integrating the firm's

information and departments, and improving flexibility. The ERP adoption was also motivated by the change in the firm's production orientation from a push to a pull mode.

4.8.3.1. Implementation stage

The firm experienced several problems during the implementation process. The project was considered to be a simple IS project that required the mere participation of IS experts. The lack of top management support negatively affected the business managers' buy-in; they did not appreciate the imposition of the system on them and felt they were being ignored. Moreover, the firm had undergone a major rationalization process and had several extension and performance improvement projects to work on. Neither top management nor the business managers were therefore involved in or available for the project. Given the lack of availability of the firm's business managers, the project team consisted mainly of external ERP and business consultants in addition to some internal IS programmers. Considering that daily activities were more important than the ERP project, many key users were not freed to take part in the project. With the lack of managers' assistance, the project became more complex and required significant resources to be realized. Because of top management pressures, the project was completed on schedule, but at the cost of the system output quality, appropriate training, and effective communication.

4.8.3.2 Post-implementation stage

When the system installation was completed, the project team left. Resistance among both managers and users was significant. The new work processes were too complex for users, who had very little training about their modules and lacked understanding of the system and the impacts of their actions on their colleagues. Moreover, the division had undergone big changes as well as a major downsizing wave that required extra process reengineering and the reconfiguration of the system. There were not enough people,

however, who understood the system infrastructure and who could make the required adjustments. Moreover, many of the trained super-users either left the company or changed their positions, which represented a loss of knowledge for the firm. Consultants were therefore hired again in order to adjust the system and train users, which added extra costs to the project bills.

The lack of managerial and user involvement negatively affected the system buy-in at the company and resulted in user resistance. The resistance was most prominent during the two first years after the project's completion, and increased with the length of service and seniority. As one respondent argued, "*People (at Company C) are very attached to their habits, they feel secure...The system threatened their stability and the control of their tasks.*" Users believed that the change was not fully justifiable, especially because "*they liked their previous system and felt comfortable with it...it was adapted to their business and it satisfied their clients' needs.*" They perceived the system as being too complex, destabilizing, and rigid in terms of reporting. The difficulty of navigating and the high number of screens and fields in each screen represented an obstacle to mastering the system. Therefore, users often bypassed the ERP and used their own parallel systems. Many other frustrated employees simply left the company.

Extensive customization was carried out in order to provide both users and managers with work processes and a work environment very similar to what they previously had. The post-installation activities, including customization and training, were realized with the assistance of external SAP consultants. Daily support, however, was provided by a SAP centre of expertise that serves Company C as well as the other divisions of the group. Even though our respondents were generally satisfied with the ERP support, they would have preferred a local team to serve Company C exclusively. According to them, a local ERP support unit would provide higher quality support since it would be more familiar with the division's type of operations and data, and closer to the users who always required assistance. Many respondents acknowledged, however, that the more the ERP was

improved and customized to satisfy their needs, the more accepting they were of it in their work environment. With the absence of an official and structured training program, some respondents were convinced that there is still a big need to learn about the system's functionalities through training, communication, and education.

The operations manager was convinced that the system provided the company with a competitive advantage, particularly because they were operating in a traditional, low-tech industry. It was, however, mainly used for the daily operations' decisions. According to the operations manager, the ERP system was mainly useful for operational rather than long-term forecasts and other strategic decisions. As for integration and cross-functionality, the operations manager adds, "*There is a very good linkage between the operations and the sales people in order to identify what's coming in the following weeks*". Moreover, after the change in the anti-dumping tax that was imposed by the American government, Company C was able to satisfy the government's requirements and was even ready for the change before the government and the customs broker. The finance people understood in fact their needs and the IT/ERP people were able to satisfy the finance department's requirements.

Given the high costs incurred during implementation and then during the post-implementation stage in order to fix the implementation errors, there were no plans to extend the system. According to the sales manager, the system didn't need to be extended since it provided the basic information to control daily operations. He stated: "*I don't want a system that would give me answers, I strongly believe in the human being and on his capacity in making decisions*". The company was therefore more at a stabilization period and an acceptance/routinization stage of assimilation than at an infusion stage.

The following table describes the different factors for each company.

Table 4-2 Summary of Findings

Construct	Company A	Company B	Company C
ERP attributes	Flexibility, perceived usefulness, impact of other attributes diminished over time as the employees got used to the system	Reliability, ease of use, accuracy, flexibility, perceived usefulness	Reliability, ease of use, accuracy, flexibility, perceived awareness
IT expertise/user support	▪ Very competent ▪ ERP steering committee ▪ Low turnover, high employee loyalty ▪ Hotline for support ▪ Night and evening shifts lack ERP support	▪ Very competent ▪ Heavy workload ▪ High ERP turnover ▪ ERP steering committee ▪ Hotline for support	▪ Very competent ▪ Centre of expertise serving other divisions with different activities ▪ Heavy workload ▪ High ERP turnover ▪ Hotline for support
Top management support and involvement	▪ CEO Participates at ERP steering committee meetings ▪ Provides the required financial support	▪ Clear strategic vision valuing ERP as an institutional tool for the firm ▪ A member of top management participates at ERP meetings ▪ Provides financial support	▪ Top management provides financial support ▪ No additional large expenditures
Absorptive capacity	▪ No previous experience with a similar system BUT long experience with the present system ▪ Basic computer literacy ▪ Training opportunities for IT team ▪ User training (early post-implementation) ▪ IT proficient users innovate with ERP	▪ No previous experience with ERP ▪ Basic computer literacy ▪ Training opportunities for IT/ERP team ▪ Inappropriate user training and education	▪ No previous experience with ERP ▪ Basic computer literacy ▪ Inappropriate user training and education

Construct	Company A	Company B	Company C
Strategic alignment	▪ ERP still among the firm's priorities ▪ ERP considered as an institutional tool for the firm's operational effectiveness ▪ Regular post-implementation reviews	▪ ERP considered to be among the firm's priorities ▪ Clear vision and business strategy that values the ERP as important for the firm's operational effectiveness ▪ Lack of understanding of the system's value among users ▪ Post-implementation review of the project outcomes	▪ ERP considered to be among the firm's priorities ▪ Lack of understanding of ERP's strategic value among some managers ▪ No clear vision
User involvement	▪ Operations manager highly involved ▪ ERP steering committee for suggestions and system improvements ▪ Sales manager not involved	▪ Lack of trust in the system capabilities ▪ New managers are supportive of the system : free users when needed	▪ Lack of involvement of several managers and key users
Reward system	▪ No changes in reward system	▪ No changes in reward system ▪ Could be a strategy to retain employees, ERP expertise and IT members knowledgeable about ERP	▪ No changes in reward system ▪ Could be a strategy to retain employees, ERP expertise and IT members knowledgeable about ERP
Post-implementation vendor support	▪ No long-term relationship with initial vendor ▪ Module vendor support	▪ No relationship with initial vendor ▪ Requires vendor support for each implemented extension or module	▪ No relationship with initial vendor ▪ Requires vendor support for each implemented extension or module

Construct	Company A	Company B	Company C
Post-implementation consultant effectiveness	▪Consulting services provided by module vendor. ▪Very important for knowledge transfer and training	▪Consulting services provided by module vendor ▪Very Important for knowledge transfer and training	▪Did not need consultants : no system extensions, no major technical upgrades
Institutional pressures	▪Competitive pressures, improving internal efficiency ▪Clients' pressures (requirements for traceability), normative and mimetic pressures of other SAP adopters and professionals	▪Improving internal efficiency ▪Government (customs) requirements: detailed, high-quality information	▪Competitive pressures, improving internal efficiency ▪Government (customs) requirements :detailed, high-quality information
Assimilation	▪System used for operational control ▪System data used for management control and strategic decisions. ▪System is the firm's backbone ▪The core of SAP/3 is implemented and deployed ▪Managers use the system (direct contact) except for the sales manager ▪New modules to extend and improve the system (e.g. Business Warehouse)	▪System used for operational control ▪Not all modules are implemented ▪System is the firm's backbone ▪To be implemented in the remaining plant ▪End-users mastering the basic functionalities of the system ▪Managers using the system outputs	▪System used for transactional-operational control ▪System is the firm's backbone ▪No projects for extending the system and acquiring new modules ▪End-users mastering the basic functionalities of the system ▪Managers using the system outputs

4.9. Discussion

The above analysis shows that the assimilation level of the same technology could differ widely depending on several contingency factors. The three case studies highlight the importance of the factors that we have chosen and shed light on other important factors. Company A enjoys a good level of assimilation (infusion that is positively impacting its performance). The two other firms are at a stabilization period and are working on fine-tuning and adjusting their system. This early post-implementation stage (acceptance/shakedown stage) was identified in the literature as a very important step in the ERP project life cycle that significantly impacts the system's future performance and outcomes (Markus et al., 2000; Somers and Nelson, 2003). This was confirmed by the experience of Company A, which successfully passed that stage.

4.9.1. ERP attributes

The companies' experiences show that the assimilation process varies over time depending on the quality of efforts made to improve the system's deployment in the firm. ERP attributes such as ease of use are more influential during the early post-implementation stage when users are learning about the system. On the other hand, output quality, such as data accuracy, timeliness, integrity and reliability, had a direct effect on assimilation. Their impact, however, decreases as these technical problems are solved, as was the case with Company A. Our findings support arguments about the importance of the perceived usefulness of the system, mainly from top management then from managers and users, to promoting the assimilation process in the company.

4.9.2. Top management support

The analysis confirms the strong impact of top management support on the successful assimilation of the system. By placing the system at the heart of the firm's strategy, managers and users got a clear message about the capital value of the system for the firm, and this clearly drove them to get involved with the system. A number of individual characteristics in managers (such as age, risk aversion, computer literacy and innovativeness with IT, seniority level, and time spent in the company) can significantly affect the level of acceptance and assimilation of the system. We identified manager characteristics instead of user characteristics because managers are in direct contact with end-users, so their perceptions of the system directly influence end-users' behaviours with the system.

In the case of companies A and B, competent senior managers with over 15 years experience with the company and limited computer literacy, resisted the change and hampered its assimilation process. However, Company A's operations manager, who had a high level of computer proficiency as well as a willingness to explore and innovate with the ERP, helped advance his department's assimilation level from routinization to infusion. Strategies to deal with resistant managers include presenting information to them in the form they desire (as in the case of Company A's sales manager) or directly involving competent but resisting managers and employees in the different stages of the project life cycle. This last strategy transformed resisting employees in Company B into super-users and change agents who championed the system and strongly encouraged its deployment. Based on his experience in another company, Company B's operations manager suggested the imposition of policies that would make the use of the system mandatory and would eliminate parallel systems. The effectiveness of these policies would, of course, depend on the managers' perceived usefulness of the system and his/her understanding of the system's value for the company's business strategy.

4.9.3. Level of IT expertise

Another important factor that is considered to be a prime facilitator of ERP assimilation is the level of IT expertise and user support in the company. As was confirmed by respondents from Company A, a high level of IT expertise is particularly essential during the stabilization of the system, as it is the period during which most of the technical problems emerge. The experiences of companies B and C, however, show that while a high level of expertise in the IT personnel is necessary, it is insufficient to improve the level of ERP assimilation. In fact, IT departments are often frustrated by the heavy workload resulting from implementation stage errors and the increased IT duties. ERP expertise is a valuable asset in all industries nowadays, and losing IT personnel could be very detrimental to a company, especially when heavy investments were made to recruit them and when they are the only people in the company who master the system. The availability of ERP experts is particularly important in limiting the inevitable post-implementation aftershocks at a time when users' requirements are the most useful and necessary to help them accept the system (Musaji, 2005). Also, when new modules are acquired, companies get the help of external consultants. The level of expertise of these consultants and their effectiveness in transferring knowledge and training users is therefore another important factor that directly affects the system's assimilation.

4.9.4. Absorptive capacity

Updating and improving ERP knowledge through training and education was considered by several respondents to be another very important, but ignored, direct factor to improve ERP assimilation. The complex, tightly integrated and cross-functional nature of ERP systems needs time to be fully assimilated by both management and employees (Zhang et al., 2005). Similarly, as ERP use evolves in the firm, both management and employee roles and responsibilities should be refined (Botta-Genoulaz and Millet, 2005, Rajagopalan et al., 2007). All company employees must therefore have a good

understanding of their jobs, of their relation to other functional areas in the company, and of how the ERP system could help them satisfy their needs (Zhang et al., 2005).

Considering managers' and users' feedback is another important determinant of successful system assimilation. For managers, the fact of being members of the ERP steering committee helps build a sense of responsibility and ownership in them that improves their assimilation. Moreover, this would make them more willing to free the employees needed to participate in ERP team activities. One other important outcome of manager and user involvement is lower turnover and higher loyalty.

4.9.5. User involvement/Manager involvement

User involvement is another essential factor that directly affects ERP assimilation. Managers' and users' feedback about the system, and their requests for changes and improvements, indicate their interest in the system. As discussed earlier, the direct involvement of Company A's managers with the ERP team promoted the system's assimilation. Moreover, managerial involvement in the ERP steering committee to make decisions about ERP improvements and changes gives managers a sense of ownership that further encourages them to get involved to improve the system's deployment. Managers, as was the case in Company A, play the role of the spokesperson by representing their subordinates and supporting their requests for system improvements. Finally, being in close contact with the ERP team and being actively involved with them allows managers to continuously learn about the system's capacities and possibilities and to avoid falling into unrealistic expectations. Also, working together with other managers on ERP issues allows them to discuss possible improvements while considering each other's interests and benefits.

4.9.6. External factors

Even though competitive pressures and the desire to improve internal operational effectiveness and preserve the leading position in the market were among the strong drivers for improved ERP assimilation, external environmental isomorphic pressures were also identified as another determinant of ERP assimilation. It could be argued that with the involvement of the ERP super-users and IT/ERP experts with the larger ERP community (through training, conferences, online forums, etc.), perceptions about successful extensions and enhancements for the system assimilation are formed (Liang et al. (2007). This therefore leads the company to improve its operations by mimicking successful actions of other companies. Coercive pressures were also considered as another type of external pressures that encouraged the improved deployment of the ERP system. Industry requirements to provide timely and integrated information for the government, as in the case of Company C, or for trading partners, as in the case of Company A, are two examples of theses forces.

4.9.7. Prevailing organisational culture

Our analysis of the cases we studied revealed how important the prevailing organizational culture is for assimilation. We know from research that cooperative and interpersonal group behaviour results in superior performance (Zhang et al., 2005). As was indeed the case with Company A, top management can nurture a culture of collaboration, openness to technological innovations, data exchange and transparency, and open and clear communication between top management and employees.

4.10. Conclusion

ERP assimilation is an area that still needs to be studied and discovered. Using case studies, this paper strives to contribute to research about this subject. The variables of our framework were validated through our research, but each of them had a different level of importance. Our findings highlight the crucial importance of top management support, strategic alignment, absorptive capacity (training in particular), ERP/IT expertise, post-implementation user involvement and mimetic and coercive pressures. The reward system was of lower importance. The impact of system attributes, such as ease of use, output quality and flexibility, on assimilation decreased over time as the system performance improved with IT support and as users were more adapted to it. A Long term relationship with the initial vendor was not a crucial factor as long as the firm deals with representatives of the same ERP brand. The consultants' level of expertise and their competence remain however to be an important factor for effective implementation of new modules and knowledge transfer that would effect the system assimilation in the firm. Organisational culture, managers' involvement and their personal characteristics (such as age, risk aversion, computer literacy and innovativeness with IT, seniority level, and time spent in the company) emerged as additional crucial factors affecting ERP assimilation. It is worth noting also, that time and the accumulated knowledge of that users gain by using the system could also significantly impact the level of assimilation of users and managers, even those with low IT proficiency.

This research represents one of the early attempts to explore a relatively unexplored stage of ERP projects: the post-implementation stage. Despite the limited number of case studies, these results may provide guidance to managers, IT professionals and consultants concerning the contextual factors which can influence positively the realisation of the aspired for benefits of ERP systems. This research may also provide insight for the factors which are most problematic and most critical for the system's assimilation and long-term success in the organisation.

Future research is required in order to validate these findings. Additional case studies in other countries and in different time frames, more extensive statistical analysis with a larger number of manufacturing companies, and more theoretical and empirical work on the obstacles of ERP assimilation would be useful in further understanding the ERP assimilation process.

CHAPTER 5 – The Impact of Contextual Factors on ERP assimilation: Exploratory findings from a Developed and a Developing Country

5.1. Introduction

Enterprise resource planning (ERP) systems are multi-module off-the-shelf software suites which seek to integrate and optimize a firm's information flow and business processes and to provide data in real-time (Law and Ngai, 2007). Lured by the numerous advantages of ERP systems and their ability to provide a competitive advantage, companies worldwide have substantially invested in ERP applications. According to the ARC Advisory Group consulting firm, worldwide ERP investments are projected to reach $25 billion by 2011 (HIS, 2007). But despite the large investments in ERPs, the relatively long experience of companies with these systems and the accumulated knowledge about ERP projects, few firms are efficiently using their systems. It has been argued, for instance, that just about 50 to 75 percent of the implemented ERP systems' functions are deployed (Yu, 2005). Another study reported that among 117 firms, 20 percent of the projects were terminated before installation was completed, and half of the remaining 80 percent were not able to realize their business objectives (Yu, 2005). There have also been studies reporting cases of initial implementation failure that transformed into success, yielding significant benefits for the business (Jasperson et al., 2005).

Completing the system's implementation is, in fact, not the end of the ERP journey. Like other complex information technologies, once the system is installed, the adopting

organization must ensure the effective assimilation of the ERP in order to be able to reap its benefits (Chatterjee et al., 2002). Effective assimilation is achieved when employees' sense of ownership of the system is high, when it becomes institutionalized in the organization's work processes, and when it is efficiently deployed at the various levels of managerial activities (Botta-Genoulaz and Millet, 2005; Carton and Adam, 2005; Cooper and Zmud, 1990). Recent ERP research reviews (Yu, 2005; Botta-Genoulaz and Millet, 2005; Ifinedo, 2008) showed an abundance of research studies about the early ERP project stages, namely, the evaluation and selection of software, vendors, and consultants, and the implementation, including subjects such as implementation methodologies, key factors for successful adoption, and potential problems that may arise during ERP implementation. Even though these subjects are of considerable importance for ERP success, studying the issues related to the post-implementation stage is necessary for ensuring long-term system success. Extending knowledge about ERP post-implementation is therefore imperative. And notwithstanding the recent tendency to study the post-implementation stage, there is still a considerable dearth in research in this field (Yu, 2005; Botta-Genoulaz and Millet, 2005). More precisely, what is lacking is a solid theoretical framework for identifying the determinants that improve the assimilation process of ERP systems in firms. A primary objective of this research is therefore to investigate the factors that could explain why some firms are more successful in assimilating their systems than others. The first research question is therefore: What determinants explain the variation in ERP assimilation among firms? By identifying these factors, firms would have a better idea of which issues to take into consideration in order to improve system deployment and increase the chances of achieving the promised ERP benefits.

Prior ERP research predominantly focused on the North American context (the United States in particular) and, to a lesser extent, the western European context. Scant studies dealt with developing countries (Ngai et al., 2008), despite the valuable lessons that could be learned from their experiences. Developed countries, such as the USA, Canada, and some western European countries, have long been the major adopters of ERP systems (Huang and Palvia, 2001). However, the ERP market in developing countries has been

expanding considerably. For instance, according to IDC, a market research and analysis firm, the ERP market in Middle Eastern and North African countries has been growing, reaching $206 million in 2006, representing an increase of 33% (IT Facts, 2007). Since the vendors of the more widely used ERP brands originate in Europe and North America, these two regions' business practices, as well as the vendors' norms and values, are very likely to be reflected in the ERP's embedded business modules (Sheu et al., 2004). Huang and Palvia, (2001) argue that in developing countries, ERP technology confronts extra challenges which are intrinsically connected to several contextual reasons such as culture, economic conditions, government regulations, management style, and labor skills. Nevertheless, studies about ERP experiences in developing countries are scarce. Additional efforts are therefore required to fill this research gap. Since most ERP research in developing countries has taken place in Asian countries, mainly China, we opted to study a country from the unexplored North African region. For our research, we chose Tunisia as the developing country and Canada as the developed country.

In spite of its small size, Tunisia has transformed itself into a newly industrialized and open economy and has, in parallel, been dynamically developing its information technology (IT) infrastructure (Yagoubi, 2004; FIPA-Tunisia, 2007a). The Tunisian economy is essentially composed of small and medium enterprises (SME), with the manufacturing sector representing about 20% of the GDP (FIPA-Tunisia, 2007b). Since signing the free trade agreement with the European Union in 1995 to remove tariffs and other trade barriers on the majority of consumer goods by 2008, manufacturing firms carried the burden of improving their products and services, in terms of quality, flexibility, reliability, and speed, in order to be able to compete with firms in more advanced countries (Yagoubi, 2004). It is also worth noting that about 47% of the manufacturing companies are totally export-based (IPA, 2008) and deal mainly with western European partners. Among other things, these firms had to modernize their technologies and upgrade their management and production methods and practices.

In order to improve their effectiveness and flexibility, several Tunisian firms adopted technologies such as computer-aided design, computer-aided manufacturing systems, and ERP systems. Since 1997, many subsidiaries of multinational companies were forced to implement the system in response to the requirements of their partners/headquarters. Subsequently, with the establishment of major ERP vendors' representatives in the country (e.g. SAP and Oracle in 1998), more and more companies, both large and small and medium enterprises, recognized the advantages of these systems and their importance for the company's long-term survival.

A second objective of this research therefore is to investigate the differences between two groups of firms: the first group operating in Canada and a second group operating in Tunisia.

This paper is organized as follows. First, we provide an account of the theoretical foundations of the concept of assimilation. Next, we present the theoretical framework that guided our empirical research, followed by a description of our methodology. Section 5 provides a brief description of the participating companies, while the case analyses and research findings are presented in section 6. Lastly, we offer some concluding thoughts.

5.2. Theoretical foundation

The diffusion of innovation theory represents our primary approach in studying the assimilation process. Roger's diffusion of innovation theory posits that both the perceived attributes of the innovation and the firm's characteristics (mainly centralization, size, slack, formalization, and interconnectedness) influence the adoption and use of an innovation (Rogers, 1995). Although it seems to be quite appropriate for studying innovation use, Roger's model has been criticized for being mainly applicable to simple technological

innovations requiring individual decision-making. More research has therefore been made, based on Roger's theory, to better explain the diffusion of complex technological innovations. For instance, Tornatzky and Feleischer's (1990) model considers three aspects of the firm's context that influence a complex innovation's adoption and assimilation process. The three groups of contextual factors, also denoted as TOE, are: technological, organizational, and environmental. The additional environment category is an important component in the model, as it could present both constraints and opportunities to its operations (Tornatzky and Feleischer, 1990). The firm's environment includes its industry, its partners and competitors, external resources, the government, and any other direct or indirect source of pressures or motivations that could impact its operations. The organizational context describes measures such the quality of its human resources, the size and scope, the degree of centralization and formalization, and the amount of slack resources. The technological context considers the internal and external technological resources that are available to the firm. The TOE has been used in several studies to examine the adoption and implementation of several IS applications, including technologies proven to be empirically appropriate and useful for studying complex innovations (Zhu et al., 2004), such as ERP systems (e.g. Bradford and Florin, 2003). The relevance of contingency factors (including organizational, technological, and external factors) for ERP implementation and benefits realization has been stressed by several researchers.

ERP systems are software packages that embed, in their basic architecture, business knowledge and business process reference models, also known as "best practices" (Srivardhanaa and Pawlowski, 2007). They also bring in the knowledge and expertise of implementation partners (Srivardhanaa and Pawlowski, 2007). All this knowledge, which evolves and increases with each upgrade, must be properly understood and applied in order to support business analysis and decision-making (Shang and Hsu, 2007). It has in fact been argued that most technologies exhibit an assimilation gap, defined as the condition in which organizational assimilation and use lag far behind organizational adoption (Fichman and Kemereer, 1999). Moreover, there has been evidence that the functional potential of IT applications is being underutilized in organizations and that they are not being properly

used. Usage is often limited to low-level features, while technology-related extensions of the available features are rarely initiated (Shang and Hsu, 2007).

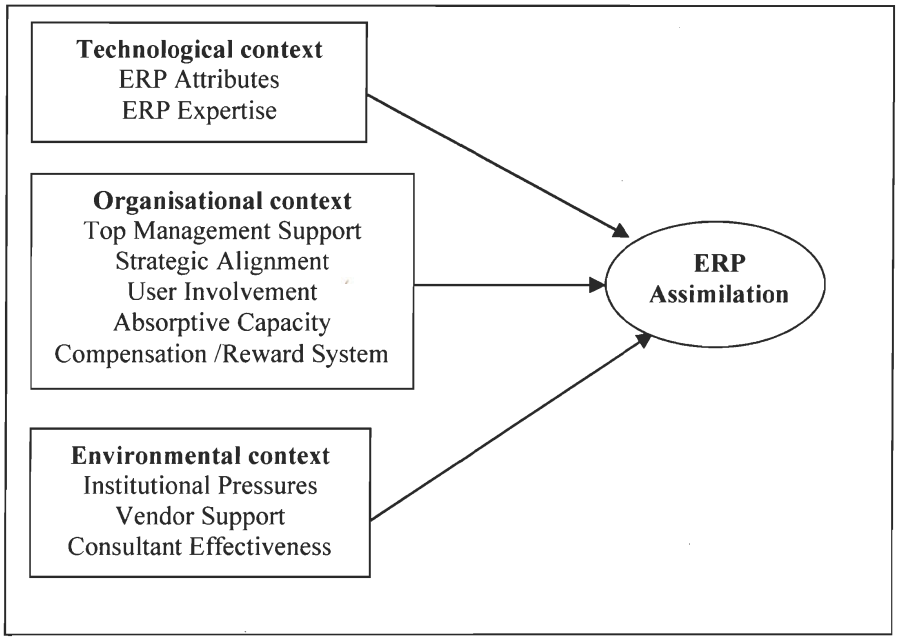
In their diffusion stage model, Copper and Zmud (1990) identify six stages for IT projects, three of which denote the post-implementation phase: acceptance, routinization, and infusion. During the acceptance stage, users are incited (mandated) to commit to using the system. During routinization, the technology's use is no longer considered to be out of the ordinary and becomes part of the work routines. Its use is sustained and becomes repetitive and spontaneous. Beyond routinization (i.e. during the infusion stage), the system becomes deeply and comprehensively embedded in the organization's work system and value chain. At this stage, the firm further integrates the system and extends its functionalities by adding new modules or applications to support new activities and reach external partners (Muscatello and Parente, 2006). With the accumulated learning and experience, users should be encouraged to move beyond the basic system features and use more of the system functionalities in order to support more sophisticated tasks (Hsieh and Zmud, 2006). Users at this stage could even try to explore and innovate with the technology to support tasks that were not recognized by the designer prior to the implementation of the system (Jasperson et al., 2005; Hsieh and Zmud, 2006). Botta-Genoulaz and Millet (2005) suggest three levels of ERP use: an operational stage in which the system is mastered to control the exiting data; a second tactical stage in which the system is used to better control the firm's operational processes; and a final strategic stage in which the system is used to support the firm's strategy.

For the purpose of this research, we define assimilation as the extent to which the system is diffused and institutionalized in the organization's work processes and managerial activities; namely, operational control, management (tactical) control, and strategic planning.

5.3. Research framework

Drawing on ERP implementation and IS assimilation literature, we focused on factors within the three main contexts that could influence the ERP assimilation process: technological context factors, organizational context factors, and environmental context factors. The following figure illustrates the research framework that guided our empirical investigation. Since our research was primarily exploratory, we chose not to specify any formal hypothesis that could act as an impediment to discovering important insights and new dimensions during our research.

Figure 5-1 Research Framework Adapted from Kouki et al., 2007; 2010



This framework postulates that the presence of three sets of critical success factors (namely, organization-related, technology–related, and environment-related) will result in the efficient assimilation of the ERP system. Similarly, overlooking these factors will cause the inefficient assimilation of the system. This would lead to an ineffective system and could even cause its failure and abandonment.

5.4. Methodology

In this research, we have adopted the in-depth case study approach (Yin, 2003) which is commonly used in information systems (IS) research (Myers, 1997). We used this exploratory approach given that little is known about ERP assimilation and the contingency factors that influence this phenomenon in a developed and a developing country. Case study research is also useful for studying complex phenomena in their natural settings and is appropriate for new topic areas (Yin, 2003; Eisenhardt 1989). Using the case study method enables us to "retain the holistic and meaningful characteristics of real-life events, such as...organizational and managerial processes" (Yin, 2003, p.2). It has been argued, moreover, that the exploratory case study is an appropriate research strategy for theory development (Yin, 2003; Eisenhardt, 1989). Unlike the approach in which the researcher does not rely on prior theory and in which the development of relevant theory, hypotheses, and concepts are a purpose of the project, we adopt the approach in which the researcher works with an explicit framework

Nevertheless, in our study we draw on prior theory – the diffusion of innovation theory and TOE framework, as well as ERP implementation and IS assimilation literature – to identify some of the factors that are relevant to our subject. Data and theory are therefore linked iteratively (Eisenhardt, 1989).

We have used the multiple case study approach in order to ensure our findings are generalizable (Yin, 2003). Six manufacturing companies were chosen: three in the Canadian province of Quebec and three in Tunisia. They were all at the post-implementation stage, with varying levels of success. A case study protocol was developed in order to guide the semi-structured interviews. The protocol was reviewed and pre-tested in three manufacturing companies in order to validate the questions and improve them. At

least five managers were interviewed in each company, including the operations/production manager, the marketing manager, the finance/accounting manager, the IT manager, and a plant manager.

The primary source of data was the in-depth interviews; however, other sources of data included field notes, documents provided by some respondents, archival data such as on-line data, and documents provided by the companies. These types of data enriched the collected data through interviews, and helped in the diversification of the different types of data. The interviews lasted between 40 and 90 minutes, and were tape-recorded with the permission of the interviewees. Respondents talked freely, especially after being assured of the anonymity of the interviews. The interview questions aimed at investigating the relevance and importance of the suggested factors for the assimilation process and on exploring any extra significant variables. Problems that had been encountered and handicaps that impacted the effectiveness of the assimilation process were also identified by the respondents.

In order to ensure the rigor of the study and the quality of the design and findings, we conducted several validity tests, as illustrated in the following table.

Table 5-1 Validity and Reliability measures

Test	Approach used
1. Construct validity/confirmability **(ensuring objectivity; limiting bias and subjectivity throughout the research)**	▪ Triangulation using multiple sources of evidence (multiple respondents, tape-recorded interviews, interviewer notes, on-line documents, other company documents); verbatim interview transcripts and notes with sufficient citations for the different portions of each case study database; key informants reviewed case study reports; research assistant reviewed interview transcripts, data analysis, and findings.
2. Internal validity/credibility **(extent to which causal relationships could be established; ensuring research credibility)**	▪ Within-case analysis; cross-case analysis; cross-nation analysis; pattern matching; cross-checking results with researchers, research assistant, and colleagues.
3. External validity/ transferability **(ensuring the findings are generalizable)**	▪ Literal and theoretical replication logic for multiple cases across two different countries; comparison with extant literature.
4. Reliability/dependability **(demonstrating that the operations of a study can be repeated with the same results)**	▪ Interview protocol; tape-recording interviews; maintaining a database of findings and collected data; multiple researchers; key informants reviewed case study report; researchers and colleagues reviewed data analysis and conclusions.

5.5. Brief company backgrounds

5.5.1. Canadian companies

5.5.1.1. Company A

Company A is a medium-sized, leading food processing company in the province of Quebec. Its products include a variety of cookies and crackers manufactured in five facilities in Quebec, Ontario, and one in the United States. Over the years, the company has experienced sustained growth, with sales exceeding $160 million US. The company needed a system that would match its requirements, satisfy its clients' demands, and help it maintain and improve its competitive position in the market. An ERP system was the appropriate answer to these needs, especially since its adoption came early (in 1997) compared to the competitors in the market. The company chose SAP above other ERP brands simply because the decision-makers "felt" it was the right product for them.

5.5.1.2. Company B

Company B is one of the leading North American producers of plastic products. It serves a wide range of industries and operates in four facilities. It has also a network of sales offices and warehouses in Canada and the United States. The main motivation behind ERP adoption was the need to integrate and standardize the firm's financial data. This motive explains the choice of JD Edwards (JDE) above other ERP brands. The choice of this brand is also explained by the low number of people required to support the system and by its lower complexity level compared to other ERP brands. Furthermore, the aging manufacturing system that was no longer supported by its vendor and the need to integrate the firm's functionalities were other motivations to implement an ERP system in the firm. The system went live in the first plant in December 2004.

5.5.1.3. Company C

Company C is a division of a leading North American pulp, paper, and forest products company. The operations of the wood division include the manufacturing, marketing, and distribution of lumber and wood-based value-added products in both Canada and the United Sates. In addition to a remanufacturing facility, Company C is currently operating only five of its eleven sawmills, due to a number of economic difficulties, including the high cost of timber, the decreased demand for lumber and wood chips, and the fluctuations of the Canadian dollar. Two main factors motivated ERP implementation in 2002. Firstly, the company needed to standardize its financial and accounting systems, and to have a unique database for its clients and suppliers. Secondly, with the increase of off-shore competition, Company C realized the need for a high-potential system that would increase its flexibility, integration, and customer responsiveness, and that would help improve its competitiveness and long-term viability.

5.5.2. Tunisian companies

5.5.2.1. Company D

Company D belongs to a leading group consisting of three agri-food companies. Company D is the largest dairy producer in Tunisia. Its operations comprise the production of dairy products, including sterilized and fermented milk, curd milk, and yogurt, as well as dry, condensed, and evaporated milk. During the past decade, the company experienced sustained growth, with over $90 million sales, mainly through the diversification of its products and the acquisition of another dairy company (hence adding a second plant to its original one). With the increasing competition in the dairy sector and consumers' increasing demands for high-quality products, Company D decided to invest heavily in a technology that would sustain its competitive position. Adopting an ERP system appeared to be the optimal solution to the firm's challenges. The company needed a system that would allow

the integration of its data (accounting, inventories, material management, etc.) and the tracking of costs, and that would improve its flexibility and visibility. The system's implementation started in 2000 and followed a stepwise approach.

5.5.2.2. Company E

Company E is a subsidiary of a leading global petrochemical company. Its activities include the production and packaging of lubricants, the storage and distribution of fuels, and the storage of Liquefied Petroleum Gas (LPG) and Bitumen. With about 400 employees, and with its diversified products, Company E is among the leaders in its field in Tunisia, with sales exceeding $100 million. The company's first ERP implementation dates back to 1996. The system integrated all of the firm's locations and plants, and operations run smoothly at the national level. In 2006, the company's headquarters decided to standardize and harmonize the African region's operations and functions in order to improve compliance among its subsidiaries, decrease operating and production costs, and satisfy and support its growing needs and strategic changes. The project was also a transitional phase towards a global (but more complex) and better-performing ERP.

5.2.2.3. Company F

Company F is one of the four companies of a leading group in all types of furniture manufacturing and marketing. Company F manufactures a wide variety of products, including wood, melamine, metallic, and plastic furniture; kitchens; and metallic frameworks and glass transformations for furniture and buildings. The company has about 1000 employees. The final products of its ten plants are sold to the group's commercializing company. With the falling of trade barriers with the EU and the elimination of taxes, the company needed to improve its productivity as well as the quality of its products. The ERP system was therefore adopted in order to help the company centralize its data, standardize

its business processes, and track and reduce its costs. The company's system went live in 2000, following a big bang approach.

Table 5-2 Profiles of Companies A, B, C, D, E and F

	Company A	Company B	Company C	Company D	Company E	Company F
Number of Employees	About 500	About 1000	About 2000	About 700	About 400	About 1000
Sales million US *(as of 31 Dec.2006)*	More than $160	More than $160	About $280	More than $90	More than $100	More than $48 (in-group sales)
System vendor	SAP	JDE	SAP	JDE	JDE	JDE
Implementation Date (go-live)	1997	2004	2002	2000	1st : 1996 2nd : 2006	2000
Implementation approach	Big Bang at the headquarters and one plant then phased by site	Big Bang at the headquarters and two plants then a year later in the third site.	Big Bang at the headquarters then phased by site	Phased-by module (stepwise approach)	Big bang	Big Bang
Reason for System Selection	• Suitable for the firm's operations • "Felt" that SAP was the best solution for them	• Requires less people for support than other brands • Less complicated than other systems Satisfies the business needs	• Already used for the paper division • Has potential for customer service, accounting, operations, etc.	• Requires less people for support than other brands • Less complicated than other brands • Satisfies the business needs • Suitable for firm size	• System chosen by the headquarters • An intermediate system before moving to a more complex one. • Satisfies the business needs	• Requires less people for support than other brands • Less complicated than other systems • Satisfies the business needs

	Company A	Company B	Company C	Company D	Company E	Company F
Motivating factors for Adopting ERP System	• Y2K problem • Clients' pressures • Need for a system that evolves with the firm's requirements • Detailed information for taxation	• Integration of the firm's financial data • Outdated manufacturing system • Need to integrate the firm's functionalities	• Need to standardize the financial and accounting systems of the division (headquarters and mills) • Need for a system that supports growth	• Centralization of the firm's data • Improving and insuring transparency in the company. • Insuring data traceability	• Part of a wider (pan African) project for business process standardization • Intermediate stage towards a more complex and higher performance system	• Improving productivity with the increased competition • Centralization of the group's data • Standardization of business processes • Cost reduction

5.6. Case Analysis

In this section, each variable of the research framework will be described, followed by the research findings of the various case studies. Table 2 provides a summary of the six cases.

5.6.1. Technological context

5.6.1.1. ERP attributes

It is strongly acknowledged in innovation literature that innovation attributes such as ease of use, relative advantage, and compatibility have an impact on the technology's diffusion and the level of use of the system (Wu and Wang, 2006; Hsieh and Wang, 2007).

All respondents agreed that the level of complexity decreases over time as users get more and more accustomed to the system. There was, however, more stress on the system's ease of use and conviviality by JDE adopters (namely, companies B, D, E, and F) than SAP adopters (companies A and C). For instance, even though company A had been using the system for more than 10 years, the complexity of some of the system functionalities led to the discouragement of its use for high-level decisions. Also, according to several respondents in companies B, C, E, and F, early post-implementation output quality issues such as data accuracy, timeliness, integrity, and reliability negatively impacted the level of users' involvement and deployment of the system, and in many cases encouraged the use of parallel systems. In spite of the frequent interventions of the IT/ERP experts, many of these issues persisted. The causes were attributed not to the system, as several respondents asserted, but rather to the human factor. Many shop floor employees were either reluctant to

enter data on time or ignored the system completely (because of lack of training during the early stages of the ERP project, hostility towards technology, rejection of change, and lack of understanding of the system's relative advantage), which negatively influenced data quality, integrity, and reliability. The domino effect of the "bad data" negatively affected system outputs, and the frustration that these problems caused led some decision-makers, in Company F for instance, to simply bypass the system and use the traditional methods of work.

5.6.1.2. IT/ERP Expertise

As users start working with the system and learning about its limits, reports of bugs and problems, and requests for adjustments and new functions become rampant during the post-implementation stage (Musaji, 2005). The presence of internal IT/ERP expertise is therefore very crucial in order to provide continuous system maintenance, fine tuning, and user support (Musaji, 2005; Kumar et al., 2003).

All the companies, except for Company E, had an internal ERP team. Company F also had a business unit for each module that identified the business people's needs and parameterized the system based on the expressed needs. Company E was supported by a virtual, multinational ERP team responsible for solving users' problems. Even though Company E's respondents were satisfied with the expertise and the level of support of the help desk, they preferred an on-site ERP team. They argued that the physical presence of the IT team would enable better interaction and understanding of users' problems. Similarly, respondents in Company C, who had a centre of ERP expertise serving all of the group's divisions, expressed the importance of having an ERP unit dedicated to their needs, especially given that the division went through critical times during the implementation and early post-implementation stages due to the significant resistance of employees towards the system. Two major problems identified by respondents in companies B, C, D, and F as hampering the system's assimilation were the heavy workload and the high turnover rate of

ERP experts. The Tunisian companies D and F justified the high turnover rate by the high demand for ERP experts and the external competitive wages of such experts. Respondents at Company F added that dissatisfaction with the new boss supervising the ERP team, his incompetence in the ERP field, the lack of trust of ERP team members in his capabilities, his negligence of their concerns and issues, and the lack of recognition and utilization of their talents, significantly contributed to the decision of departure of several skilled IT employees. In order to limit the drainage of its experts, and the resulting negative effect on the firm's performance, senior management at Company F motivated its engineers with a significant increase in salary in order to accelerate and improve the deployment of its production module. In fact, before the passing away of Company F's ERP project leader, the department heads met with all those who worked on the ERP on a weekly basis to brainstorm about system developments and improvements, to exchange experiences, and to learn about each department's needs.

With the arrival of the new project leader, who lacked ERP competency and who was essentially assigned based on his seniority, all of the mentioned activities disappeared and there was no follow-up regarding the system's problems. This negatively impacted the motivation level of his subordinates, who were much better skilled with the system. Consequently, much of the work focused on improving the deployment of the existing modules instead of extending the system with new modules. Evening and night shifts represented a different type of problem for Company A. Most of the evening and night workers were less trained than their day colleagues and the ERP team members were mostly available during the day. Efforts were made to provide appropriate support for evening and night shifts, but it was insufficient. Another critical point that can hinder ERP assimilation, as noted by respondents at companies B and D, is an organizational culture that values product innovations over IT innovations. They argued that the system's acceptance and assimilation would have been much easier if their organization's culture assigned a higher value to IT innovations, the IT department, and IT objectives and strategies.

5.6.2. Organizational context

5.6.2.1. Top management support

Top management support has been recognized in ERP literature as essential for the success of the ERP project (Law and Ngai, 2007). Although the type and level of support throughout the ERP project stages might vary, this factor remains an important determinant for sustaining and promoting effective system use (Nah and Delgado, 2006). Several researchers have stressed the importance of financial support during the post-implementation stage, to cover costs such as IT infrastructure, ERP upgrades, ERP training, and IT and ERP resources. It has also been argued that top management's perceptions of and attitudes towards the system could shape the norms and values of the organization to facilitate (or impede) system assimilation (Chatterjee et al., 2002).

All the companies reported that they were receiving adequate financial support for upgrades and system requirements from senior management. Companies C, E, and F, however, often found it difficult to justify the need for financial support, particularly because the system's return on investment (ROI) takes longer than other investments. Therefore, the availability of financial support does not necessarily reflect the real perceptions of top management about the system's usefulness and value. In Company A, for instance, the CEO was consistently involved in person in the ERP steering committee to discuss system developments, and the system was always among the firm's top priorities. Similarly, middle managers were generally actively involved in the system's development processes, and many took part in the ERP steering committee meetings to exchange experiences and suggest improvements for the system. However, top management involvement and support was lower at companies C, D, and F. In Company C, the significant lack of involvement of both top management and middle managers during implementation negatively affected system buy-in in the company when the system was installed. Resistance was significant, and therefore extensive efforts were made to adjust

the system and satisfy users' needs. Due to the considerable amount of money spent on the system during the early project phases and the numerous problems encountered during early post-implementation, there were no plans for any extensions, and upgrades were essentially technical. In Company D, frequent delays and problems experienced after the implementation of each module resulted in top management not fully trusting the system's capabilities and lacking interest and support. Furthermore, priority was always given to projects with quicker and more tangible returns than those of the ERP system. As a respondent at Company B put it, "*Culturally speaking, priority is given to investments in products and not in IT.*" Indeed, respondents at companies B, D, and F stressed the importance of the role of top management in transforming the organizational culture and supporting the prevalence of an ERP culture, "*a culture of openness, information sharing, doing work on time, real-time, and transparency.*" Respondents at Company D also stressed the importance of top management interventions to solve issues that were hampering the acceptance and assimilation of the system: political conflicts; the shortage of personnel, which led to heavy workloads that prevented users from mastering the system; the lack of information sharing; and hostility to the "new" system among several users. Despite the awareness of top management of the system's potential in improving the firm's performance, they did not make use of any policies to encourage or even impose system use, which negatively impacted system assimilation. In fact, the operations manager at Company D emphasized that in order to reap the rewards of an effectively assimilated system, strategic willingness must go hand in hand with operational willingness. Imposing the system's use, strict control of users to prevent them from using parallel systems, and the relocation of employees who produce parallel reports were examples of operational policies that respondents suggested top management could apply in order to improve system assimilation.

5.6.2.2. Strategic alignment

It has been widely recognized in the literature that alignment gaps between IT systems and business strategies are a chief cause of the failure to benefit from the IT systems'

potential (Preseley, 2006; Rathman et al., 2005). Researchers in this field seem to agree that major gains are realized when the IT supports, stimulates, and enables the firm's strategy (Tallon, 2008). Evaluating the system's strategic alignment involves not only the system's support of the firm's strategy but also the IT's support of the business processes, the IT's reporting relationship with top management (IT-top management distance) and involvement in business strategy formulation, and the management practices that impact alignment (Tallon, 2008; Rathman, et al., 2005).

Companies A and E exhibited the highest level of strategic alignment. The system was highly valued in these firms by both senior and middle managers, and was always considered to be an institutional tool for the firm's operational effectiveness. One exception, however, was the sales manager of Company A, who persistently preferred his own work methods and was never comfortable with the system. The main issue in the remaining companies was the lack of understanding of the system's strategic value and that its value goes beyond cutting costs. The situation was in the process of improving in Company B with the arrival of the new CEO and the new managers, all of whom had experience with ERP systems. ERP and business staff collaborated better to improve the system's deployment, and the business vision clearly emphasized the system's importance for improving the firm's performance. At Company C, the system was treated more like an IS project than a business project. Even though the system performance was improving, several managers perceived the ERP as a mere replication of their older "good" system. The significant lack of involvement of businesspeople with ERP people, as well as the decision of senior management to freeze any further developments in the ERP system, increased the strategic gap. Even though the system was originally chosen based on its fit with the firm's strategy, Company D suffered from significant alignment gaps once the system was implemented. As the company's IT manager put it, the system's potential would be appreciated better and the alignment gap would be reduced "*by the realization of the equation: objectives of IS equals objectives of top management.*"

One interesting factor that was highlighted by respondents at companies B and F is the reporting relationship between the IT manager and the CEO on the one hand, and the IT manager and other department managers on the other hand. A respondent at Company D argued that the fact that the IT manager was at the same reporting level as the other departments' managers compromised the execution of his recommendations. In fact, these recommendations were seen as emanating from a mere peer rather than serious orders from senior management. Moreover, the fact that at Company B the IT service was supervised by the finance department reinforced a general perception in the company that the function of the ERP system was to primarily serve the finance department and to tighten control over the other departments' operations. These perceptions negatively impacted the system assimilation level in the company.

Improper communication between business and ERP people was another issue that increased the alignment gaps, such as in the case of Company F. After the death of the first ERP project leader, several managers, mainly those who had been working in the company for a long period of time and who were resistant to any change, were reluctant to communicate their needs.

5.6.2.3. User involvement

Unlike other IS projects, ERP user involvement has been argued to be more beneficial during the post-implementation stage than earlier stages (Wagner and Newell, 2007). Companies must therefore understand how to promote user involvement to ensure long-term ERP assimilation success. According to Wu and Wang (2006), as users gradually learn about the system by experiencing it (experiential learning), they start to understand the system's functionalities and to explore its possibilities and limits. They can therefore better describe their requirements and ask for adjustments to satisfy their needs (Musaji, 2005). The more they are satisfied with the system, the more they are engaged with it and the higher their level of assimilation (Wagner and Newell, 2007).

The ERP steering committee at Company A presented users with a valuable tool to get their voices heard. During the committee's regular meetings, users' suggestions were evaluated and classified by priority for possible implementation. Over time, and as the system stabilized, users became more satisfied with the system and there were no major requests for changes. Later on, it was mostly IT-savvy users, who were motivated to test and discover the system, who made suggestions to improve or modify some aspects of the system. IT respondents at companies B, C, D, and F stressed that users' seniority (number of years with the company, even if they were not old), computer literacy, and ability to express their needs were elements that had a significant impact on the level of involvement with and commitment to the system. For instance, during the early post-implementation stage in Company C, there was a general dissatisfaction with the system in some departments and sawmills, mainly due to the three above-mentioned factors. Therefore, significant efforts had to be made to better understand users' needs and problems and to customize the system based on these needs.

At companies D and F, shop floor employees in some plants were reluctant to key in data and considered the act of low importance for their tasks. According to an ERP team member at Company F, the education level of users plays an important role when it comes to their ability to properly articulate and express their needs, since this impacts their level of engagement and involvement with the system. The fear of being controlled and of sharing information "*that was considered to be theirs*" was another handicap to getting involved and committing to the system. One important factor that was highlighted by respondents at companies B, C, D, E, and F was the level of involvement of managers and its impact on their subordinates' commitment to and involvement with the system. For instance, the level of system deployment at the plants of Company F widely differed depending on managers' perceptions of the system's value and their trust in the system. The ERP roll-out units specializing in each module at Company F were in fact designed to bridge the gap between the technical ERP experts on the one hand and the managers and users on the other hand,

with the hope of better understanding the latter's needs, and encouraging their involvement and assimilation with the system.

At Company B, the arrival of the new managers who had ERP experience improved the level of collaboration and involvement of users with the ERP. The IT/project manager asserted, for instance, that it became easier for him to obtain approval for freeing the required users for training and to collaborate with the managers in improving the system. At Company D, the IT manager stressed that the fear of change and destabilization among managers discouraged them from taking an active part in the system improvements and deployment. Likewise, at Company D, the reluctance of middle managers to commit to the system was a result of their "*fear of becoming unnecessary for the firm's functioning.*" For those who had more trust in the system, their limited involvement was also attributed to the heavy workload of the daily tasks, especially with the exponential growth of the company's operations while preserving about the same number of employees. According to the sales manager, even though the managers were motivated to improve their use of the system, the lack of time and the heavy workload prevented them from concentrating on learning and mastering the system. As a solution to the lack of involvement and commitment, and their corollaries (parallel systems, double checking, etc.), Company D's IT manager and Company B's operations managers believed that if the system's use was imposed by top management through policies and strict rules, the level of system use and assimilation would considerably improve.

At the other extreme of the spectrum, managers at Company E had a very high level of system ownership and commitment to the system. Moreover, brainstorming sessions and meetings to discuss changes and exchange experiences were common rituals in the company, including its plants. The prevailing organizational culture was one of the main factors highlighted by most respondents as being crucial to increasing the involvement level of both users and managers, and to increasing the assimilation level in the company. Respondents in Tunisian companies emphasized that an organization must understand the

mindset and culture behind the ERP system, which is based on openness, real time, and doing things on time, a culture that differs from what was prevailing in several Tunisian organizations.

5.6.2.4. Absorptive capacity

Absorptive capacity is the ability to acquire, assimilate (understand and interpret), and exploit external information (Cohen and Levinthal, 1990). Ravichandran (2005) opines that this capacity is influenced by the firm's prior knowledge as well as by its investments to acquire, assimilate, and exploit new knowledge. In addition to the firm's prior IT and ERP knowledge, it has been argued that training, education, and communication are among the most important factors for ERP post-implementation (Jasperson et al., 2005; Muscatello and Parente, 2006; Willis and Willis-Brown, 2002). Post-implementation training and education allows users to deeply assimilate the system by updating their knowledge, improving their understanding of the system's implications for the organization's processes, and better understanding their actions' impact on downstream operations (Jasperson et al., 2005; Nicolaou, 2004). Effective communication between key users, IT/ERP personnel, and other external partners improves knowledge exchange and system usage (Nah and Delgado, 2006; Nah et al., 2007).

Among the six companies studied, only Company E had previous experience with an ERP system, which explains its smooth transition towards developing a high-level ERP system and a high level of assimilation of the system. In addition to their high-quality help desk, the fact that the system permitted interaction with a bigger population of users (pan African) allowed Company E's users to benefit from a wide pool of rich system knowledge. This allowed them to enrich their own use and experiences, and to learn about better and more sophisticated uses of the system. Due to their accumulated learning and long experience with the system, most of Company A's modules were deployed nearly to their maximum potential. Consultants were the major source of knowledge for companies A, B,

C, E, and F when new modules were to be implemented or assistance was needed concerning the interaction between modules (as in the case of Company F). In these companies, the IT teams had upgraded their ERP knowledge mainly through conferences and on-line user groups, in which ERP knowledge is shared with the global ERP user community. The issue of the absence of a knowledge management system that captures and stores the acquired knowledge and experience was highlighted by several interviewees when discussing ERP knowledge resources. One other major missing element, according to most respondents, is a formal post-implementation training program. Several respondents, mainly IT managers, expressed the need to update users' knowledge of the system, its evolving requirements, and the repercussions of each user's actions on others and on the final system outcome. Companies B, C, D, and F were in fact suffering from varying levels of redundancy and parallel systems, which significantly lowered their system assimilation efficiency. This redundancy was essentially attributed to the lack of training and proper communication. At Company C, for instance, implementation budget cuts primarily targeted training, which caused several post-implementation problems. Company C's IT manager asserted that post-implementation training should be done periodically "*in order to see how people evolve in their learning and system use and in order to assess the needs of future training or business process improvements...It is very important to sustain training, especially during the first years of post-implementation.*" Newcomers, in the case of all the studied companies, were informally trained on the job by their colleagues, learning only the very basic actions needed to do their work. Some respondents highlighted the negative impact of such informal training on the level of understanding and assimilation of the system; this explains the heavy and recurrent need of new system users for IT support, especially when faced with unexpected problems. As a respondent in Company F pointed out, unless new recruits are curious about the system, IT-savvy, and/or have spare time for trial and error, most of them limit themselves to the very basic functionalities they learned from their colleagues.

5.6.2.5. Compensation/reward system

There has been evidence that reward strategies, such as rewarding the acquisition of new skills and linking compensation to company profits, promote learning and the institutionalization of favorable behaviors (Jerez-Gómez et al., 2005). In a study evaluating the importance of critical success factors across ERP project phases, Nah and Delgado (2006) found that ERP team skills and compensation were the most important factors for the post-implementation stage. Kei and Wei (2008) strongly recommended contingent rewards and praise to foster learning, risk-taking, innovation, collaboration, and collegial support for ERP success.

None of the studied firms, however, changed their reward system to encourage and reward ERP system use or to retain ERP experts and trained superusers. Companies B, C, D, and F experienced a high turnover rate of their ERP experts and trained superusers. The high demand for ERP expertise was a problem commonly cited by respondents. According to the IT manager at Company C, "*People find big opportunities somewhere else... ERP opens doors. We're talking about significant increases of advantages for the employee who leaves to work with a consulting company versus being an employee in the company.*" Company F respondents also stressed that the relatively low wages of IT/ERP experts significantly contributed to their departure, which significantly affected the level of deployment of its ERP modules. As was mentioned in section 6.1.2, after the massive departure of ERP and IT experts in Company F, top management decided to increase engineers' wages to encourage the deployment of its production module. In Company B, the frustration of the IT/ERP experts with the heavy ERP workload (programming, troubleshooting, reports preparation, parameterization, etc.) and the heavy reliance of users on them, in addition to other IT tasks, pushed many of them to leave the company. Respondents at Company A, however, were proud of the high level of loyalty of their employees, especially the IT/ERP team, which they attributed to the "family-like" ambiance that prevailed in the company and the "good" wages compared to other companies in the industry. Similarly, Company E did not suffer from the impacts of ERP

experts' turnover because their support team was multinational and virtual. Like Company A, there were no problems of competency turnover.

5.6.3. Environmental context

5.6.3.1. Institutional pressures

It has been argued that the institutional theory helps in understanding IT diffusion (Salemron and Buenoi, 2006). The institutional theory posits that structural and behavioural changes in companies are influenced not only by the desire for efficiency but also by the company's need to legitimize itself in its external environment (Benders et al., 2006). DiMaggio and Powell (1983) argue that due to this need for legitimization, mimetic, coercive, and normative pressures influence organizations to become more and more similar to each other, or to a phenomenon called institutional isomorphism. Mimetic forces drive decision-makers to mimic the choices of other organizations, often leading companies, and face uncertainty as a result. Coercive forces are exerted by resource-dominant organizations (such as parent corporations, dominant suppliers, and customers) as well as by government regulations and policies, and industry and professional associations. Normative pressures are exerted by professional communities and professional standards that could, directly or indirectly, force the firm to assimilate the ERP system. When studying the impact of these forces in the context of ERP systems, Liang et al. (2007) concluded that these forces, mediated by top management, have an important influence on ERP assimilation during the post-implementation stage.

In all the companies studied, the desire to improve internal efficiency and performance and to preserve a leading position in the market was among the main drivers towards better deployment of the system. There were, however, other external pressures that pushed some firms to use the system effectively. After most of its competitors adopted

ERP systems, Company A felt a strong need to surpass its competitors not only by further deploying the system's functionalities, but also by innovating with the system. Moreover, their major clients were an important coercive pressure towards ensuring the traceability of the firm's products. The customs requirements for updated and detailed reports were another coercive force that obliged Company C to integrate its data and provide the government with reliable and high-quality reports. At Company E, the requirements of the firm's headquarters to master the system and to comply with the work norms of other regions' divisions for further global integration represented a major pressure driving the firm to use the system efficiently. It was mentioned by several members of the ERP teams/units that taking part in ERP conferences, on-line forums, and training sessions motivated them to improve their system deployment. This is in fact a form of normative pressure.

5.6.3.2. Vendor support

Maintaining a strategic relationship with and a lifelong commitment to the vendor is believed to be vital for the ERP adopting firm (Wang et al., 2008; Somers and Nelson, 2004; Chang, 2004). With the rapid technological development of ERPs and the desire of companies to extend and enhance their systems, continuous investments are required (upgrades, new modules, etc.). Given that the original vendors are knowledgeable about their customers' businesses, processes, and requirements, they are well-equipped to serve the firms' needs. Therefore, vendor support, which can include technical assistance, software updates, emergency maintenance, user training, and other support services, is judged to be very important for the ERP's success and efficient deployment (Wang et al., 2008; Chang, 2004; Somers and Nelson, 2004).

In our research, many of the interviewed companies did not maintain a strategic relationship with the original vendor. This was the case in companies A, B, C, D, and F. In

the case of the subsidiary Company E, there was no direct contact with the vendor because the system was implemented by an internal team of the multinational group, who assist the subsidiaries in installing the system. Company F was the sole company that maintained contact with its initial vendor, but only for updates.

5.6.3.3. Consultant effectiveness

Consultant effectiveness refers to the competence and expertise of consultants in providing various types of assistance to firms, such as knowledge, training, maintenance, technical support, and any other type of help the organization needs (Wang et al., 2008; Ifinedo, 2008). Although the use of consultants has been commonly considered as essential for the ERP implementation stage, it has been found that this factor is of great importance for the post-implementation stage as well (Plant and Willcocks, 2007; Nah and Delgado, 2006).

Experiences with consulting services differed among the companies studied. Companies A, B, and D needed external expertise intervention when implementing a new module. In the case of Company A, the module vendor provided an expert to install the module, train the ERP team, and transfer the necessary knowledge for the module's key users. Respondents from Company A stressed the "extreme importance" of the high expertise of the consultant even during the post-implementation stage, because as in the case of the other implemented modules, the company needed to properly learn about the module and its different functionalities. Company C did not need any consultants because there were no major upgrades or system extensions. Company F decided to end its contract with its implementation consultants about five years after the initial implementation, as they found the consultants' support no longer advantageous and lacking the innovativeness needed to further improve system deployment in the firm. According to one ERP team

member, the consultants' task was limited "*to simply replying to questions (about issues) that had to be very specific...even the answers were very abridged and they always referred us to the documentation that we already had before about the system.*" According to the company's ERP team, that type of support was already available for free using the on-line JDE user communities. A new consulting service had, however, been approached to provide training and technical support for new modules that the company was planning to implement. In Company F, training was mostly about the interaction between modules. In Company E, respondents opined that even though the virtual help desk was very competent, the presence of the consulting team was essential during the system's stabilization. Unfortunately, this was not possible because the consulting team was responsible for implementing the system at other subsidiaries in Africa. According to a respondent, "*Contacting the (implementation team) while they are in another site does not only disturb them but also slows down the other project, but we need these people's support.*" The respondent further asserted that during the post-implementation stage, most of the help was provided by the virtual desk.

5.7. Evaluation of assimilation in the studied organizations

The assimilation level varied widely across organizations and within the same country. Company A had the oldest experience with the ERP system, which was diffused across all of the firm's departments. The core system capacity was deployed to over 85%. According to Company A's respondents, the system was deeply embedded in the firm's work routines and provided almost all of the required information to make decisions. Efforts to improve the system's effectiveness have not stopped since its introduction in 1997, especially after the widespread adoption of the system in the industry. These improvements included both deepening the functionality deployment of the already-installed modules and extending the system with new modules. The ERP system mainly supported operational control and, to a lesser extent, management control. Strategic and

planning decisions, however, were made outside the ERP system, as it was considered to be too complicated.

At Company B, the system was at a stabilization stage. Two of the plants were integrated and a project to integrate the third plant was under way. System deployment was limited to the basic functionalities. However, parallel system use, redundancy dissatisfaction among users and managers, and lack of trust in the reliability of the system's outputs were prevailing in the company. Efforts to improve system deployment were being made, especially after the arrival of the new CEO and managers. The system served the operational control needs, while the managerial and planning decisions were made with other systems. Despite the challenges experienced, the system represented a main source of data for the company. The system was satisfying most of the finance department's needs, but was only responding to 30 to 40% of the operations department's requirements. According to the operations manager, this was the case because ERP was primarily implemented to standardize and centralize the company's financial information, with the hope that additional advantages would be felt in other departments.

At Company C, the system had just recovered from a painful implementation and post-go-live problem phase. Overall, managers were satisfied with the system, especially after considerable customization to serve managers' and users' needs. The operations manager maintained that since they were operating in a traditional, low-tech industry, the system provided the company with a competitive advantage. The ERP was mainly used for daily operation decisions. According to the operations manager, the ERP system was more useful for operational decisions than long-term forecasts and other strategic decisions.

At Company D, the approach used was the phased-by module (also called stepwise) approach. Several modules were implemented, but they lacked complete cross-functional integration, which hindered the traceability of the products' costs. The system was

considered to be a basic source of data for several departments and was believed to serve about 50% of the company's needs. In spite of the numerous problems surrounding the ERP initiative, as discussed in the sections above, significant efforts were being made by the IT department to stabilize the system, integrate the modules, and to improve its deployment.

At Company E, the system was also at a stabilization stage. The transition to the new system was smooth and assimilation was rapidly taking place. The system was diffused across almost all of the company's units and all of the implemented modules were integrated, therefore providing the managers with an enterprise-wide visibility. The ERP represented the backbone of the company and supported operational control. As the system becomes more stabilized and its outputs more reliable, the system will be used for managerial control as well. However, planning and strategic decisions were currently being made outside the system using less complicated software.

Finally, at Company F, the level of assimilation differed widely from one department to another and from one plant to another. Since top management's objective was to control the costs of the company's inputs and outputs, the inventory modules were mastered and very effectively deployed. The main problems, however, concerned operations and production. The production modules' deployment differed widely depending on the manager's motivation as well as on the product's level of complexity and resource requirements. According to a plant manager, the difference in deployment of the production modules did not directly impact the level of productivity, but it did affect the level of information exchange and traceability of costs, and the quality of decisions. The system is diffused across almost all of the company's departments and therefore represents the basic source of information for several departments. Since the death of the first project leader, all of the optimization efforts aimed at deepening the functionality deployment of the existing modules, and no extensions of the system were made through adding new modules.

It is worth noting that several managers praised the fact that ERP decreased the time needed to gather critical information for all levels of decision-making. However, they stressed the importance of the human being's role in making decisions and solving problems compared to a system that produces automated decisions. In fact, most of the interviewed managers thought of the system as being mostly transactional and as being unsuitable for strategic and planning decisions.

Table 5-3 Summary of Findings

Construct	Company A	Company B	Company C	Company D	Company E	Company F
ERP attributes	Flexibility, perceived usefulness, impact of other attributes diminished over time as the employees got used to the system	Reliability, ease of use, accuracy, flexibility, perceived usefulness	Reliability, ease of use, accuracy, flexibility	User friendly, easy to manipulate, embeds a whole culture and mind-set	Reliability, flexibility, perceived usefulness/relative advantage (more advantages than older local system).	Ease of use, perceived usefulness, user friendly, flexibility
IT/ERP expertise	+ Very competent, low turnover, high employee loyalty - Night and evening shifts lack ERP support	+ Very competent, - Heavy workload, high expertise turnover	+ Very competent, centre of expertise serving also other divisions - Heavy workload, high ERP expertise turnover	+ Very competent, - Heavy workload, high ERP expertise turnover	+ Virtual multinational ERP help desk, very competent - Importance of physical presence to properly coach users.	+ ERP team includes programmers for each module+ roll-out units for each module +Very competent team members - The present ERP project leader, lacks expertise and motivation to advance and to improve, high ERP expertise turnover

Construct	Company A	Company B	Company C	Company D	Company E	Company F
Top management support and involvement	+ Participates at ERP steering committee meetings, provides the required moral and financial support	+ Provides financial support, willingness to benefit from the system, understanding of the system value for the firm - Lack of operational application of the willingness to assimilate the system, priority to products innovations with quick tangible benefits	+Provides financial support - Require ROI justifications for expenditures: often difficult for ERP people) - lack of appropriate understanding of the system value : ERP considered as "another IS software", significant lack of involvement	+Provides financial support -lack of trust in the system due to its problems, lack of involvement in the project, lack of appropriate understanding of the system value, require ROI justifications for expenditures: often difficult for ERP people)	+Provides financial support, high involvement of local top management, highly ranked in the firm's priorities, continuous follow-up of the system developments	+Provides financial support -lack of involvement in the project, lack of appropriate understanding of the system value, priority to extension and product development projects
Absorptive capacity	+ No previous experience with a similar system but long experience with the present system, training opportunities for IT team, ERP steering committee - No post-implementation training, need for a knowledge management system	+ Training opportunities for IT/ERP team - No previous experience with ERP, basic computer literacy, inappropriate user training and education, need for a knowledge management system	- No previous experience with ERP, basic computer literacy, inappropriate user training and education, informal training by coworkers for new users, need for a knowledge management system	- No previous experience with ERP, basic computer literacy, inappropriate user training and education mainly due to heavy daily workload and the unavailability of users to be trained	+ Successful experience with ERP, meetings of plant manager and subordinates for brainstorming sessions, virtual exchanges between managers - No formal post-implementation training, -Importance of physical presence of trainers.	-No previous ERP experience, inappropriate user training, no more brainstorming sessions, importance of computer literacy, level of education of users to better express their needs

Construct	Company A	Company B	Company C	Company D	Company E	Company F
Strategic alignment	+ ERP still among the firm's priorities, considered as an institutional tool for the firm's operational effectiveness, regular post-implementation reviews, rejection of the sales manager of the system	+ ERP considered to be among the firm's priorities, clear vision and business strategy that values the ERP as important for the firm's operational effectiveness -Lack of understanding of the system's value among users, post-implementation review of the project outcomes	+ERP considered to be among the firm's priorities -Lack of understanding of ERP's strategic value among some managers, no clear vision	-Lack of trust in the system, ERP not considered as a priority, lack of alignment between the IT and the top management objectives, no clear vision linking ERP to the firm's strategy, lack of managers' involvement and commitment to the system	+ERP considered to be among the firm's priorities, considered as an institutional tool for the firm's operational effectiveness, regular post-implementation reviews	- ERP not considered as a priority, lack of alignment between the IT and the top management objectives, no clear vision linking ERP to the firm's strategy, lack of managers' involvement and commitment to the system
User involvement	+ Operations manager highly involved, ERP steering committee for suggestions and system improvements, sales manager not involved	- Lack of trust in the system capabilities, rejection of the system by several users, use of parallel systems, an employee to double checks outputs using excel + New managers are supportive of the system	- Lack of involvement of several managers and key users, legacy thinking requiring extensive customizations to satisfy users' needs. + Improved system buy-in after customizations.	- Lack of involvement of several managers and key users: reluctance to apply IT mangers' instructions, fear of sharing information and being controlled, users not properly expressing their needs, resistance to change	+ high involvement of employees and managers, users' suggestions taken into consideration	- Lack of involvement of several managers and key users, users not properly expressing their needs, resistance to change, reluctance of shop-floor employees to use the system, differing levels of involvement

Construct	Company A	Company B	Company C	Company D	Company E	Company F
		+ New managers free users when needed by the ERP team		+Suggestions to modify and improve the system are taken into consideration		of plant managers impacting the overall productivity
Post-implementation consultant effectiveness	▪ Consulting services provided by module vendor. ▪ Very important for knowledge transfer, training and integration of new modules	▪ Consulting services provided by module vendor ▪ Very Important for knowledge transfer and training	▪ Did not need consultants : no system extensions, no major technical upgrades	▪ Consulting services provided by module vendor ▪ Very Important for knowledge transfer and training	▪ Internal team of consultants (belong to the group) ▪ Permanent availability of support	▪ Ended contract with original consultants ▪ New contract with other consultants to provide training for ERP team about new modules and integration
Institutional pressures	▪ Competitive pressures, improving internal efficiency ▪ Clients' pressures (requirements for traceability), normative and mimetic pressures of other SAP adopters and professionals	▪ Improving internal efficiency ▪ Government (customs) requirements: detailed, high-quality information	▪ Competitive pressures, improving internal efficiency ▪ Government (customs) requirements :detailed, high-quality information	▪ Competitive pressures, improving internal efficiency	▪ Competitive pressures, improving internal efficiency ▪ Coercive pressures of the headquarters ▪ Normative pressures (requirements of conformity with the region's subsidiaries)	▪ Competitive pressures, improving internal efficiency

Construct	Company A	Company B	Company C	Company D	Company E	Company F
Assimilation	▪ System used for operational control ▪ System data used for management control ▪ System is the firm's backbone ▪ The core of SAP/3 is implemented and deployed ▪ Managers use the system (direct contact) except for the sales manager ▪ New modules to extend and improve the system (e.g. Business Warehouse) ▪ System feeding "cockpits" for each department to group the key performance indicators and other decision-making clues	▪ System used for operational control ▪ Not all modules are implemented ▪ System is the firm's backbone ▪ To be implemented in the remaining plant ▪ End-users mastering the basic functionalities of the system ▪ Managers using the system outputs ▪ System not fully deployed : basic functionalities used ▪ Prevailing parallel system ▪ User resistance	▪ System used for transactional-operational control ▪ System data used for management control ▪ System is the firm's backbone ▪ No projects for extending the system and acquiring new modules ▪ End-users mastering the basic functionalities of the system ▪ System not fully deployed (stabilization stage) ▪ Use of parallel systems	▪ Partial integration of modules ▪ Doesn't allow yet costs traceability ▪ System used for operational control ▪ Mostly ascending information exchanges vs. cross-functional exchanges ▪ Projects for extending the system with additional modules ▪ Working on cross-functional integration ▪ Main source of data ▪ System not fully deployed (implementation/ stabilization stage)	• System used for operational control • System integrated at the national and regional level • System outputs used by manages • System data used for managerial control • System not fully deployed (stabilization stage)	▪ Different levels of module deployment depending on the manager's willingness, product complexity ▪ Has a negative impact on information exchange ▪ Lack of data reliability due to the users' lack of involvement ▪ Prevailing parallel systems ▪ User resistance ▪ Strategic vision to deploy the system

5.8. Discussion

This study primarily aimed at exploring the factors that influence ERP assimilation in the contexts of a developed and a developing country. In fact, the end of the system's installation marks the start of a set of significant efforts to ensure appropriate system deployment and infusion in the company. A second objective of this research was to investigate whether the impact of these factors differs between a developed and a developing country. The following is a discussion of our findings.

5.8.1. What determinants could explain the variation in ERP assimilation among firms?

A relative commonality exists across the studied companies regarding the determining and constraining factors for achieving a high level of ERP assimilation. First, this study affirms that regardless of national differences, top management support is strongly related to effective ERP assimilation. While providing the required financial support is necessary, it is not sufficient for promoting assimilation in the company. Top management's knowledge about the system, its potential for the company, and its requirements should be regularly reviewed and updated. Clear and effective communication is also necessary between the ERP/IT manager and top management in order to dispel any resistance, lack of trust in the system, or confusion resulting from the challenges of the post-installation stage. A main task of top management is ensuring the continuous alignment of the system with the business vision and strategy, and communicating the latter clearly in the firm. Alignment would also be improved by integrating the IT function as a potential contributor to business imperatives and by considering the system to be a valuable strategic resource rather than a cost to minimize or a cost-effectiveness tool (Willkocks and Sykes, 2000).

In order to reinforce the commitment of all employees and the effective deployment of the system across the organization, top management must use their authority to resolve political conflicts and influence the behaviors of both managers and users by encouraging or imposing system use. They could also reinforce the policies prohibiting parallel systems and redundant data, and a strict control of system use could eliminate deficiencies and force system deployment for at least basic user tasks. As in the case of Company A, assimilation would then progress over time to reach infusion, when more system features and functionalities are used to accommodate more tasks (Saga and Zmud, 1994), and when system extensions are implemented by adding new modules, new functionalities, and add-ons to enhance system value.

Another lesson learned from this research is that middle managers' involvement in and ownership of the system is crucial to encouraging system assimilation in their departments (Yu, 2005). It is worth noting that this research showed that in cases where top management are highly supportive of the system, middle managers were also engaged with it. First, actively involving managers through regular meetings with the ERP team to exchange experiences, brainstorm about improvements, extensions, and upgrades, and discuss suggestions proved to be a very effective activity to ensure the continuous support and involvement of middle managers. Second, middle managers' positive perceptions and support of the system are very important, because these managers can then diffuse positive perceptions about the system and its value, empower their subordinates to accept their (new) enriched tasks and make the system use part of their routine work, encourage the innovative and deep deployment of the system features to satisfy more of their departments' needs, free up resources when required for system developments and optimization, and encourage users' involvement.

Users' involvement during the post-implementation stage is also a valuable ingredient for system acceptance and assimilation. Users actually contribute to stabilizing the system and creating a viable, practical system for the company (Wagner and Newell, 2006). With

their situated practice, users learn more about the system limitations and start suggesting changes and modifications to satisfy their needs. This mostly takes place during the early post-implementation stage (post-go-live), when users start using the system and discovering the discrepancies between their old and new methods of work. It is, however, crucial that the ERP team listens and considers users' requirements in order to ensure their acceptance of the system. This could be done effectively through an ERP steering committee that includes both the firm's ERP experts and the managers, who discuss and prioritize suggested changes, or ERP roll-out units for each module that directly contact the users of the concerned module, as in the case of Company F. Failure to satisfy users' needs and answer their requests, due to the lack of expertise, the overwhelming work of the ERP team, or the inability of users to properly articulate their needs, would cause the rejection of the system. This would then lead to the spread of parallel systems, redundancy, and increased reliance on the old methods of work. Moreover, elements such as education level, seniority, IT proficiency, and openness to change are factors that could moderate the impact of users' involvement.

The above discussion leads us to highlight an important factor that emerged from this research: organizational culture. Previous research has discussed the importance of this factor for ERP success (Ifinedo, 2007; Nah et al., 2007; Motwani et al., 2002), as well as the fact that overall success can be significantly enhanced if there is a match between the system's culture and the organization's culture (Ifindeo, 2007). ERP assimilation would be greater and easier if the organizational culture values IT and IT strategies and objectives. Our data analysis also showed that open cultures that promote learning, transparency, knowledge and information sharing, innovation, collaboration, and cooperation are more likely to assimilate the system well than those that lack these characteristics. Our findings also stress the fact that top management have a crucial role in shaping the organizational culture through their actions, interventions, and policies to improve system assimilation. Incentives and rewards, for instance, could be utilized to keep users motivated to learn and be open to sharing knowledge (Al-Mashari et al., 2006). Rewards could include praise for work, promotions, and pay increases.

Another important insight is that a skilled and competent internal IT/ERP team is a significant success factor for the post-implementation stage and for facilitating the system assimilation process (Yu, 2005). The quality of this team's support and training, and their ability to solve users' problems, are essential to promoting users' buy-in and commitment to the system, especially during the early post-implementation stage, when the risks of technical problems and performance dips are high (Willis and Willis-Brown, 2002). The inadequate resolution of post-implementation problems, along with top management's lack of knowledge and understanding of the system, often overshadows the potential benefits that could be achieved once the system is stabilized (Willis and Willis-Brown, 2002). The advantage of an internal ERP team is their good knowledge of the organization's processes, their proximity to workers, which enables them to better evaluate the problem and its consequences, and the ability to have quick and direct onsite exchanges with users, especially in the case of an emergency. With the high turnover rate of ERP expertise and the skill shortage, top management should set flexible human resource policies on pay and contracts, and provide opportunities for career development (Willkocks and Sykes, 2000). A competent, well experienced, and knowledgeable ERP leader is also important for motivating and retaining ERP-skilled personnel, as is providing them with opportunities to demonstrate their capabilities, be creative, and learn; listening to their concerns; and providing feedback to improve their knowledge and skills.

In particular, the ERP leader should be highly competent with the system and should have strong leadership that enables him or her to motivate the ERP team and efficiently guide the firm to progressively extend the value of its system (Willis and Willis-Brown, 2002). Recognizing and using the talents of other team members and rewarding individual contributions would help retain ERP expertise. Based on our findings, the ERP team often had difficulty justifying the ROI of the ERP upgrade to top management, especially when significant problems were faced during implementation and early post-implementation. For that reason, the ERP team should stress the numerous business benefits resulting from enhanced system functionality instead of using cost savings as the sole motivator behind

the system upgrade (Beatty and Williams, 2006). Modular add-ons such as Web portals, data warehouses, and customer management systems are but a few examples of extended functionalities. It is worth noting that the effect of ERP complexity fades over time as users become more familiar with the system, resulting in a higher level of system deployment and better assimilation. However, issues with the system's output quality, such as output reliability, integrity, completeness, and timeliness, as well as the negative and/or unclear perceptions about the system's usefulness and relative advantage, were considered to be major handicaps to system assimilation. These problems were mainly attributed to improper training and education during the early stages of the ERP project, and the absence of a post-implementation upgrading program.

Indeed, the firm's absorptive capacity proved to be another important factor for improved system assimilation. First, our data analysis showed the critical value of a formal post-implementation training program, which is imperative for improving system assimilation and for ERP success (Nah and Delgado, 2006), especially if this activity was overlooked during the implementation stage. Neglecting this component negatively impacts the level of system assimilation mainly in terms of deep usage and innovativeness with the system. Also, in spite of its immediate advantages, such as low cost, informal training by learning from other workers and imitating their work without any theoretical foundation increases the risk of transferring inefficient and undesirable work methods and reduces the worker's creativity (Yagoubi, 2004). Findings from our research suggest that the system knowledge of both users and managers should be updated and continuously evaluated in order to ensure effective deployment of the system and keep users motivated to learn (Kei and Wei, 2008). Moreover, to be effective and successful, the training program should emphasize both the system view – learning about the system's use and its different features – and the organization view, learning how the system and the user's actions affect other business processes (Rajagopalan et al., 2007).

Second, in order to cope with the high turnover rate of ERP experts and superusers, and with the constantly increasing knowledge of the system (from external parties such as vendors and consultants, workers' experiences with the system, etc.), the use of an ERP knowledge management system was considered to be a highly effective tool to encourage learning as well as knowledge sharing and creation. An ERP knowledge management system would include ERP knowledge repositories (manuals, databases, files, etc.) that would track problems and record solutions, experiences, and other system knowledge, to be retrieved later for sharing and reuse (Gunasekaran and Ngai, 2007). This initiative could also accelerate the integration and adaptation of new recruits, who would have available to them all the necessary documentation about the system as well as the documented experiences of other users. The knowledge management initiative would also comprise the formation of communities of practice (Wenger and Snyder, 2000), including a cross-functional ERP steering committee, in which top managers are members of the committee, and in which formal and informal meetings take place between employees using the same module in different plants. Such communities would enable the exchange of knowledge, experiences, and brainstorming on improving the system and its deployment. Top management should, however, provide the appropriate conditions to effectively establish such communities. Freeing up part of employees' time, for instance, would be necessary for encouraging their participation in order to improve their knowledge and better master the system.

Unlike in previous research (e.g. Chang, 2004), our findings showed that maintaining a strategic relationship with the system vendor was not essential, especially in the long term. Services such as updates and maintenance could be obtained from other vendors. Consultant effectiveness, however, remained an important factor for assimilation. Consultants, whose services can also be provided by the module vendor, must display a high level of competence and expertise when it comes to installing and integrating a new module, and lowering knowledge barriers by training the ERP team and users. With their experience, they can help improve system assimilation and deployment and extend the system's value (Ifinedo, 2008). Institutional forces vary across companies, depending on

their industries and markets. The strongest forces are government regulations and the pressures from headquarters and external partners to properly assimilate the system in order to be able to provide integrated, detailed, and real-time information. The economic motivation remains, however, the main incentive for properly assimilating the system, deploying its functionalities to the maximum, and continuously optimizing its value in order to fully benefit from its advantages.

5.8.2. What are the differences between the two groups of firms?

Our second objective is to investigate the differences between the two groups of the studied firms. Indeed, it is important to say from the outset that if our findings, as we saw earlier, showed several commonalities between the two groups of companies, a number of (issues and) constraints were more conspicuous in the Tunisian context than the Canadian one.

In fact, one of the main handicaps to assimilation in the Tunisian companies D and F was the persistent reluctance amongst several of their managers to commit themselves to adopting the system and their strong objection to changing their traditional working methods. No doubt by being so, they caused, among other things, the ongoing lack of integration (and aggregation) of the organization's data and they limited the constructive sharing of information between the different units of their firms. The managers' lack of commitment can be attributed to two main factors. Firstly, for many managers, information is not considered a corporate asset. It is rather, a personal asset which should be shared selectively with other employees in the firm (Davison, 2002). As one respondent argued: *"the(se mangers') possession and control of information provided them with a source of power that became threatened with the system's adoption*". Additionally, there is the rejection of the plant workers to spend extra time entering data and their perception of the system as merely adding extra load to their duties, controlling their actions and even

tracking their mistakes. No doubt, this had badly impacted the quality of the system's data and outputs (i.e. their reliability, accuracy, completeness and precision) which, in turn, had frustrated the managers and discouraged them from using the system.

The lack of users' and managers' commitment and the fear of the loss of power were also problematic in the Canadian companies B and C. This problem was mainly due to the employees' satisfaction with older systems, the lack of involvement of the business managers in the implementation stage, inappropriate training and education during the implementation stage and to the fear of losing jobs. All in all, however, it was easier and relatively faster for the IT/ERP units in these companies to limit these problems than in the two Tunisian companies D and F. Whereas the IT/ERP manager was seen as being a coach for users in the Canadian companies, the high power distance, in-group loyalty, and competitiveness amongst Tunisian managers discouraged many of them from accepting the leadership of the IT manager and dissuaded them from following his/her instructions. This was mainly the case of Company D where the IT/ERP manager's recommendations were perceived as unacceptable orders from a colleague. Needless to say, such a competitiveness between managers and the resulting fear of appearing incompetent in terms of mastering the system further hampered system assimilation by discouraging inexperienced managers and novice ERP users from benefiting from the experiences of other managers working in another "sister" company and who were more advanced in the system deployment and had a better level of assimilation. Therefore, it is incumbent upon Tunisian IT managers to strive to build strong relationships based on collaboration, trust, mutual understanding and clear communication if they really want to ensure the involvement and commitment of managers and users to promote the assimilation of the system in the company. These efforts need to be buttressed up by the support of senior management and by the reduction of the reporting relationship distance between the IT manager and top management. Indeed, a closer direct reporting relationship with top management puts the IT manager at a senior position which would allow him/her to enjoy a higher level of authority in the organization. Depending on his/her persuasion skills and personal appeal, the IT manager would have a greater opportunity to influence top management perceptions about the system and to

persuade them to intervene actively in imposing the usage of the system and in promoting ERP assimilation (Law and Ngai, 2007).

As for the Canadian companies, and in particular Company A, the management style that that focused on participation, consultation and on seeking consensus, contributed enormously in solving conflicts and problems which surfaced during the early post-implementation stage. No question such a positive approach was instrumental in the improvement of the user's buy-in and commitment to the system. Yet, suggestions that the larger Canadian companies B and C should impose stricter rules to enforce the use of the system and limit the use of parallel systems do indicate that the resort to some formal rules and authoritarian policies can be advantageous for some companies striving to improve system assimilation among subordinates.

Participation, consultation, group brainstorming were also common in Companies E and F. However, the passing away of the highly motivated project leader in Company F and the arrival of an inexperienced manager in ERP systems and his lack of interest in advancing the project had a significant bad impact on the system assimilation and discouraged the company's employees to progress in their system deployment and assimilation and put off the ERP unit's team members enthusiasm for developing and extending the system.

One other issue that challenged effective assimilation in the Tunisian companies D and F was the tendency to use seniority more than skills as an indicator of qualification, which was found to discourage creativity, innovations with the system and the establishment of individualized rewards (Yagoubi, 2004). "*Seniority is very dissuading since hard workers and lazy ones are on an equal footing*", to quote a respondent. Seniority also presented one of the major handicaps to ERP assimilation in the Canadian companies, resulting in resistance to the system's deployment and low assimilation levels. In a move to

attenuate the level of resistance, one of the companies integrated some senior workers with the ERP project team as change agents. On the one hand, they served the ERP team by supplementing them with information about the business, and on the other hand, they acted as motivators for the employees, encouraging their acceptance of the system.

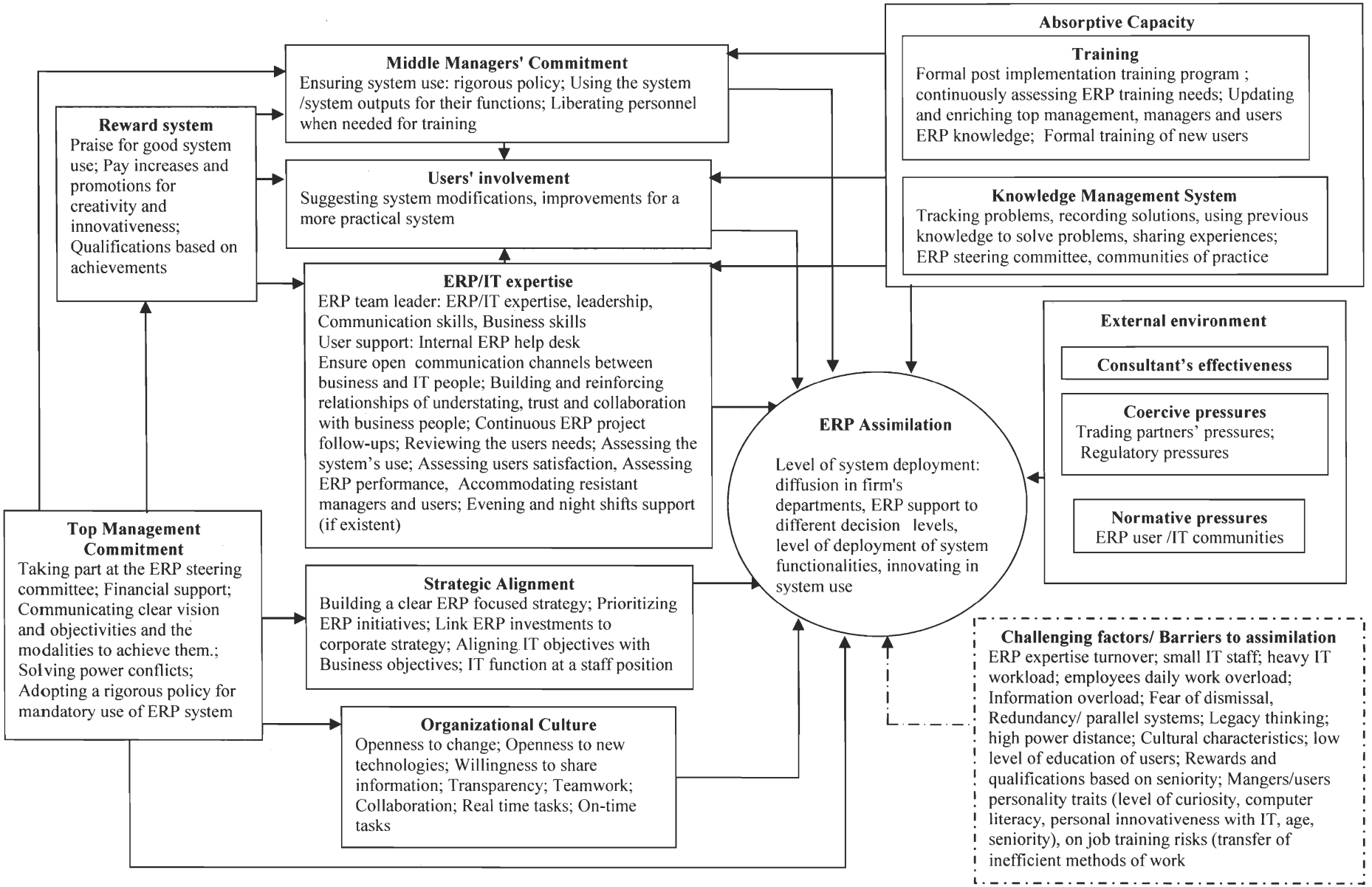
Furthermore, the prevailing short-term orientation among managers in both contexts and their perception of the ERP business value that focused more on operational effectiveness than on strategic payoffs had an obvious effect on the orientation of their ERP system and its level of assimilation. Indeed, the great majority of the interviewed managers focused more on short term cost reduction and quick tangible results than on strategic outcomes. As a result, the system was mainly deployed for operational control and follow-up, automation of routine administrative tasks, and cross-functional information exchange. However, in the case of company A which consider the system as a level for strategic effectiveness, efforts to extend the system's capabilities and to enhance its assimilation were continuous.

Compared to companies D and F, Company E was in a much better position and exhibited a high level of system assimilation even though its system was in a much better position and exhibited a high level of system assimilation even though its system was still at a stabilization stage. This wide difference in assimilation level can be attributed to several factors. First, Company E had a lengthy, successful prior experience with ERP systems. Second, this company is a subsidiary of a European multinational company that has been established in Tunisia for more than 80 years. Therefore, the values and culture of the European company, including information sharing, open communication, participation, encouraging learning and collaboration, and motivation, were deeply rooted and clearly manifested in its subsidiary. A similar organizational culture prevailed in the Canadian, medium-sized Company A and also resulted in a high level of assimilation. Indeed, unlike the two other large companies, Company A was characterized by a "family ambiance" that valued participation, consultation, and seeking consensus. Similarly, the fact that this

company's organizational culture promoted learning, risk-taking, and innovation encouraged a deeper deployment of the system functionalities and the extension of the system value by investing in new modules (Nah and Delgado, 2006; Kei and Wei, 2008).

Figure 5-2 illustrates the refined module of our research based on our findings.

Figure 5-2 An Integrative Framework for ERP Assimilation



5.9. Conclusion

The present study adds to IT innovation diffusion literature by investigating the long-neglected assimilation stage and ERP assimilation in particular. In addition, it begins to fill the ongoing gap in research on ERP experience in developing countries. Our results show that there are numerous similarities in the success factors deemed to be critical to ERP assimilation in both the Canadian and Tunisian cases. Nevertheless, our findings reveal that there still exist a number of serious barriers that must be overcome in both countries, and especially Tunisia. With the most challenging issue being the human factor, organizations should invest heavily in terms of time and effort to manage properly this resource.

With both medium sized experienced companies showing higher level of assimilation, our findings proved that, unlike previous studies suggesting that large organizations are more likely to succeed in their ERP initiatives than SMEs (e.g. Ifinedo, 2007; Mabert et al., 2003), the two medium sized companies reached higher levels of assimilation and succeeded better than large organizations. Secondly, our study showed that the organizational culture had a strong impact on the business practices of the concerned companies. In the same vein, our analysis results shed light on the capital importance of time and experience for successful ERP assimilation. Indeed, with time, assimilation in terms of data integration, diffusion across the various organizational units (departments, plants, warehouses, etc.), and deep deployment of the system's features is achievable. However, advancing the system from the level of supporting operational decisions to higher levels of decision-making is uncommon. This is due to the technological complexities of ERP systems when dealing with higher levels of decision-making, to the managers' strong belief in human judgment and creativity and mainly to the top management operations focused perception of the ERP business value.

Finally, the fact that several observed issues that showed up in two of Tunisian companies did not replicate across the three cases and the fact that the success factors of

Company A were not also common across the three Canadian cases, we cannot resolve that the observed issues are typical of the studied contexts, i.e. the developing country and the developed country contexts. Additional investigations about the impact of the national context and the cultural characteristics would be useful to determine the presence or absence of such impacts.

There are some limitations to this study. First, this study is exploratory and was based on the perceptions of some respondents representing their organizations. Therefore, personal bias cannot be totally ruled out. Second, even though our case studies confirmed the influence of several contextual factors, our findings were based on companies at different stages in the post-implementation phase and using ERP systems from different vendors. Comparing companies at approximately the same stage and/or using an ERP from the same vendor and/or having similar sizes would make the collected data more comparable. Finally, cultural characteristics and elements of the national environment such as politics, language, economic conditions were not considered in this study. Nevertheless, prior research argued however that these factors could have an impact on ERP initiatives (Davison, 2002; Waarts and van Everdingen, 2005; Sheu et al., 2004). Our findings cannot therefore be generalized to companies in other countries.

A first area of future research is extending the data and testing the relationships depicted in Figure 5. Our study was limited to comparing two countries, a developing and a developed country. The effects of the factors investigated in this research could be revised and validated by including a greater number of companies in both countries or by including more countries.

An additional interesting avenue of research would be to consider the impact of cultural dissimilarities and national conditions on ERP assimilation. Another research avenue is to closely investigate the ERP assimilation strategies in the subsidiaries of multinational companies. Learning about the strategies that facilitate the assimilation

process in these companies could be useful for other companies in the same country in reducing the cultural misfits between the adopted system and the adopting organization. Another research area would be investigating the long-term effects of ERP systems on decision-makers and the extent to which ERP systems provide the required information for decision-making.

Conclusion

In this final chapter, we conclude our study. In the first section, we will present a brief overview of our findings. Then, we will highlight the theoretical contributions to the overall research in the field of ERP before discussing the main implications for practice. After that, we shall examine our research limitations and we shall propose in the final section a number of opportunities for future research.

6.1. Overview of main findings

While organizations' objectives to implement an enterprise-wide IS may greatly differ, ultimately a joint objective can be seen when their system is effectively assimilated in a given firm for an eventual achievement of the aspired benefits which motivated the initial adoption of the system. As a matter of fact, the increasing worldwide implementation of ERP systems, along with the high rates of ineffectively deployed systems, and the high risks of failure in sustaining long term success, had all necessitated the investigation of post-implementation issues and the monitoring of the effectiveness of how these systems are assimilated. By mainly providing a deeper understanding of ERP assimilation, this research positions itself in the emerging stream of research of ERP systems and its post-implementation stage in particular.

Drawing on several streams of research such as IS diffusion and infusion, ERP literature, organizational assimilation, and the TOE framework, and using at the same time a qualitative research methodology, this study explored the impacts of a number of selected factors on ERP assimilation. In the same vein, it investigated several additional factors

influencing the effectiveness of this process. All in all, we have attempted throughout our study to answer the following key question:

What are the determining factors behind the variation in ERP assimilation among firms?

Based on the results of the case study analysis of six manufacturing companies in two different geographical contexts (a developed country (Canada) and a developing country (Tunisia)), we proposed an integrative framework of the facilitating factors and discussed the impediments of an effective ERP assimilation. Our results demonstrate these main findings.

Firstly, one must not ignore the fact that the post-implementation stage is a tight ring in the ERP lifecycle. In other words, not only does the degree of success of the post-implementation process depend heavily on the quality of the implementation process, but also it has a significant influence on the degree of efforts required to promote ERP assimilation during the post-implementation stage. This concerns mainly the degree of top management commitment and support to the system, training and education efforts, and the managers' and users' perceived usefulness of the system.

Secondly, with time (i.e. time span since the system was installed), the impact of the human factor on the degree and effectiveness of ERP assimilation supersedes the technological factors. This is chiefly suggestive of the support of top management which is the key factor behind the, promotion, directly and indirectly, of the pace and depth of ERP assimilation across the organization. Suffice it to say that this is very critical especially during the early post-go-live stage, called also the shakedown or stabilization stage. Indeed, the top management's good understanding of the risks and possible hurdles and complications of the shakedown down phase—like the possible performance dip, the low

system performance, the increased requirements for extra expenditures on overtime labor, consultant services and additional IT resources— is of capital importance in helping the organization and its employees overcome that risky period and in setting the grounds for a successful system assimilation.

This stage is very fragile and its success is essential for the system's survival and the subsequent progressing in the assimilation levels. There is no question that top management's views of the system's usefulness and its potential for the organization, despite the possible (short-term) difficulties, contribute, for instance, in shaping the perceptions of both middle management and users in operational positions and the embedded organizational culture of the company. These could be reflected, for example, in their participation or follow-up of the ERP project's evolvements and upgrades, their providing of adequate financial support for system developments, maintenance and extensions, their alignment of ERP unit objectives with business objectives. In addition, there are the clear and focused ERP organization's strategy, the changing of the reward system and investing in high quality ERP expertise and in continuous training and education.

Similarly, a closer and direct reporting relationship between top management and the IT manager who would rank the IT manager (and the IT function) at a senior position can provide him/her with more authority and influence in the organization (Law and Ngai, 2007). By being at a senior position, the IT manager may be seen by other managers as a senior executive. This can facilitate the execution of the IT manager's recommendations about the system. Correspondingly, as a senior executive, the IT manager can participate at the firm's strategic planning, thus improving the strategic alignment between the organization's strategy and the system. Equally, the close and direct relationship with the top management cannot only help the IT manager influence the top management perceptions about the system, but it can also make him/her gain their support for an active intervention and promotion of the system assimilation. Successfully handling top

management perceptions about the system are, however, highly dependent on the IT manager's persuasion skills and personal appeal (Law and Ngai, 2007).

Furthermore, our study stresses the importance of the personal traits of managers and users, such as level of curiosity, computer literacy, personal innovativeness with IT, age, seniority, education level, etc., in promoting or hindering system assimilation. Therefore, organizations should invest heavily in time and effort to manage carefully and properly the human factor. This can be realized through several initiatives such as effective post-implementation training, communication and education, appropriate user support and reward systems, ERP communities of practice which allow users to exchange experiences and improve the existing system.

As far as the impact of the environmental context is concerned, regulatory pressures, trading partners' pressures, and consultants' effectiveness were the main external factors identified in this research as factors influencing ERP assimilation.

Comparing the two groups of companies in the two contexts showed several commonalities in success factors and issues which, by and large, were related to the stabilization periods almost all companies were going through with the exception of Company A which exhibited a higher level of assimilation than all other companies. This is true of all success factors which were identified, as well as the great majority of ERP assimilation impediments. Yet, there are some issues which were more apparent in two Tunisian companies (D and F) than in their Canadian counterparts and the other Tunisian company. These include, but not necessarily apply to each of the two companies, the persistent reluctance of several mangers to commit themselves to the system, power and interests conflicts between middle managers and the IT manager, the tendency to use seniority more than skills as an indicator of qualification, and the high competitiveness between managers. Conversely, these problems are not common in the medium sized

subsidiary of the multinational company, which was also at a stabilization stage but of a second ERP project. Indeed, similar to company A, this subsidiary enjoyed an organizational culture based on consultation and openness to innovations in general and technological ones in particular.

These findings show us a number of important remarks. Firstly, the time and experience factors are is capital in reducing the negative effects of the post-implementation stage issues and the assimilation impediments. Secondly, the impact of the organizational culture is significant in affecting the success of the ERP assimilation process. Moreover, unlike previous studies which stressed the fact that large organizations are more likely to succeed in their ERP initiatives than SMEs (e.g. Ifinedo, 2007; Mabert et al., 2003), our findings showed that the two medium sized companies reached higher levels of assimilation and succeeded better than large organizations. Finally, due to the fact that several observed issues which came up in two Tunisian companies did not replicate across the three cases and that the success factors of Company A were not also common across the three Canadian cases, we cannot generalize by stating the observed issues are typical of the studied contexts in both countries. Additional investigations on the impact of the national context and the cultural characteristics will be extremely useful in determining the presence or absence of such impacts.

Finally, our research demonstrated that while being powerful transactional engines for the operational control, ERP systems by adding significant amounts of information to decision makers, are still thought to increase the complexity of the decision making process at higher managerial levels. This judgment sheds light on the importance of extending the ERP system, with add-ons or systems that, for instance, possess analytical and planning capabilities which could further improve the system assimilation in the adopting organization.

6.2. Contributions

This study has several theoretical contributions not only to IS researchers working on complex IT and on ERP systems, but also to strategic management researchers. Similarly, our research has a plethora of implications for practitioners and managers in organizations in both developed and developing countries, which already adopted or are willing to adopt ERP systems.

6.2.1. Theoretical contributions

The present study is one of the first studies to investigate the long neglected ERP assimilation during the post-implementation stage. Prior research focused mostly, if not squarely, on issues confronting ERP practitioners during the early stages of an ERP project such as package selection, vendor, selection and package implementation deemed necessary to "get the system to run" (Jacobs and Bendoly, 2003), Consequently, there is still a big dearth of researches on system assimilation and usage considered the main long-term rational which motivate the system's adoption in the first place (Jacobs and Bendoly, 2003). In many respects, our work is an attempt to answer the recent calls to direct ERP research towards new horizons far beyond the somewhat exhausted research arena of post-implementation stage. In essence, we have tried to extend the innovation diffusion research by providing deep insights on the determining factors and concomitant challenges of the assimilation of a complex IT innovation.

Indeed, given the limited research on post-implementation issues and ERP assimilation, we used an exploratory qualitative approach. Drawing on information and insights we gained from the qualitative study during which we interviewed managers with varied responsibilities in six manufacturing organizations, we added to ERP research

namely by identifying the facilitators of a successful ERP assimilation. Another major contribution is the discovery of several impediments which may slow or even hamper the effective assimilation process in both contexts. Similarly, we contributed to research by proposing an integrative framework which illustrates the relationships between the different factors we had identified. Needless to say, this framework can be instrumental to future investigations of the assimilation process of other complex IT and enterprise systems.

At this juncture, it is important to state that our findings do in many ways support the idea that an ERP system is more of a business' and a people's project than a technological one. In fact, it is considerably influenced by many contextual factors which are intrinsically related to several organizational, technological and environmental variants. Needless to add that few studies have empirically studied the impacts of contingency factors such as IT resources, organizational and environmental ones, in the first place, and ERP assimilation, in the second place. This is regardless of the fact that studies that explored the impacts of institutional factors and ERP are equally rare. As such, we do thinks that we contributed to research by filling these two gaps.

By applying the TOE framework for ERP assimilation, another major theoretical contribution is the fact that we stressed the solid theoretical basis of the TOE framework and showed that it is useful not only for the early stages of an innovation adoption, but also for later stages that come after the adoption of an innovation and namely the crucial post-implementation stage. No wonder then the TOE framework proved to be very useful in identifying the facilitators and the inhibitors of the assimilation of ERP systems.

To our best knowledge, this research is the first on ERP assimilation that searched the effects of two different contexts: a developing and a developed country (that is Tunisia and Canada). In spite of the escalating investments in enterprise systems application in North Africa, our present research adds enormously to our knowledge of ERP experiences in a

region that is still neglected in the overall ERP research. By investigating the similarities and the differences between companies located in the two countries, this study also contributes to the relatively scarce research on the impact of national environments on ERP practices.

6.2.2. Contributions to practitioners

There is little doubt that practitioners not only in the above studied countries but also in countries with similar contexts can benefit from our research in several ways. Firstly, the integrative framework we suggested, along with the lessons learned throughout the research, can guide practitioners (particularly ERP project managers, top management, and other managers) in firms willing to adopt an ERP system. In fact, our work can tell them much on how to promote ERP assimilation and what to watch for during their ERP implementation stage. It can also inspire them in handling their post-implementation assimilation efforts. Similarly, practitioners who are experiencing low assimilation levels and struggling with post-implementation predicaments can have a much better understanding of underlying causes and possible remedies. In addition, practitioners can benefit from the determinants and the handicaps which we identified if they seek to develop the appropriate interventions that will improve assimilation and limit its pitfalls. In doing so, organizations can accelerate the value creation of the ERP system and the achievement of its benefits.

6.3. Limitations

Given the lack of previous research on ERP assimilation, this study was in essence exploratory and is based on the multiple case study design. That is why limitations of the case–study approach apply to this study. Firstly, our research is hinges on personal

perceptions of the respondents. Even though we used several measures of validity and reliability to improve the research's rigor, personal bias could not be totally ruled out. Likewise, by adopting a qualitative approach, this research provided a deeper understanding of the drivers and issues of ERP assimilation. However, the results cannot be automatically generalized to larger populations as the selected cases do not necessarily represent the whole population.

Secondly, although we adopted a multiple case study design using six manufacturing firms, we cannot pretend that we have covered all organizational practices, possible factors, and issues influencing the assimilation process. Moreover, since the chosen companies operated in different manufacturing industrial sectors, the specific characteristics in the external environment, such as the level of competitiveness, the level of volatility or stability of the market, the level of IT use in the industrial sector, can affect the observed results.

Finally, the chosen firms were at different phases in the ERP post-implementation stage, used diverse ERP brands, and were of dissimilar sizes. Considering companies at approximately the same stage and/or using an ERP from the same vendor and/or having similar sizes would make the collected data more comparable. Of course, we must not forget that our choices were strictly limited by the number of companies which accepted to share their ERP experience.

6.4. Future research

Our study sets the foundation for several future research areas which we do feel are extremely important and need to be better explored.

The main objective of this research was to explore the determinants of ERP assimilation rather than to test relationships. Several relationships figured in our integrative framework were observed and need to be tested using confirmatory factor analysis to validate our findings and to determine whether they are generalizable or typical of the studied cases.

Secondly, different implementation approaches were adopted by the companies we studied. Further ERP assimilation research could investigate the impact of the implementation approach on the level of assimilation. Furthermore, as was mentioned in the limitations, in section 6.1.3, our research used companies with different sizes and ERP brands, and they belonged to different industrial sectors. We recommend that cases with comparative characteristic be used to improve the results validity. In addition to providing more understanding to managers, sector specific, or brand specific or size specific findings would allow the refinement of the framework according to the studied specificities. Similarly, our research demonstrated that ERP systems need time to stabilize and to progress towards higher levels of assimilation. Since the early stages of ERP post-implementation are known to be very problematic and frustrating for all the organizations, revisiting the firms and assessing their advancement and improvements in their assimilation process could update the developed framework and enhance our understanding of these systems.

As a result, another rewarding research would be to investigate ERP assimilation success factors and to carry out cross-case studies in other national contexts, either in other countries in the studied regions or in totally different regions. Similarly, prior research indicated that several national/environmental characteristics impact ERP practices. That is what future research could consider factors which we did not consider in our research. This is true, for example, of a country's economic status, language, political environment, and its government's efforts to promote the IT infrastructure, etc. The findings of these two

research avenues could certainly validate our findings and could result in a framework that is adapted specifically to some particular regions.

Another important remark is the fact that in spite of the pervasiveness of these systems, firms are still reluctant to be open to share information. Furthermore, several areas of ERP research still need to be explored. This means that case study research methodology will unquestionably remain one of the most important methodologies of choice for the investigation of unexplored areas of ERP research.

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APPENDICES

Appendix 1- The Email Sent to the Key Persons in the Participating Companies

Bonjour M./Mme,

J'aimerais solliciter votre participation à ma recherche. Je suis une étudiante de doctorat à l'Université Laval, encadrée par les professeurs Diane Poulin (Université Laval) et Robert Pellerin (École Polytechnique de Montréal).

Mon sujet porte sur «Les facteurs d'assimilation des systèmes ERP dans les entreprises manufacturière». La partie empirique de cette étude se fait tout d'abord par la réalisation de 5 études de cas d'entreprises manufacturières ayant implanté un système ERP.

Pour la réalisation des études de cas, je dois interviewer les personnes suivantes:

- Les gestionnaires qui ont un impact sur la gestion des opérations manufacturières à savoir :
  - Le vice-président opérations
  - Le vice-président production
  - Le vice président finance-comptabilité
  - Le vice président marketing
  - Le(s) chef(s) d'usine(s)
- Le vice-président technologies d'informations afin d'avoir une idée sur le projet d'implantation du système

Le but de ces entrevues est d'identifier les facteurs qui ont facilité (ou freiné) l'assimilation du système au sein de l'entreprise. Ces entrevues ont une durée variant de 40 à 60 minutes et peuvent se dérouler dans un lieu du choix des répondants, s'ils le souhaitent. Il va sans dire que toutes les données sont traitées de façon confidentielle. Les entrevues sont enregistrées pour faciliter l'analyse. Néanmoins, si la personne se sent mal à l'aise, il est possible de procéder autrement. Il est bien évident, que chacun des décideurs que j'aimerais rencontrer est libre d'accepter ou non de participer à l'étude.

Je peux vous assurer que toutes les informations reçues seront traitées confidentiellement et ne serviront qu'à des fins académiques. Je peux aussi, si vous désirez, signer une entente de confidentialité concernant les informations acquises chez vous.

Les résultats de cette recherche vous seront par la suite communiqués. Ces résultats vous permettront de faire le diagnostic de votre expérience ERP, d'avoir une idée des expériences d'autres entreprises manufacturières et de vous comparer à celles-ci. Ce qui peut être riche en enseignement.

Il est à noter que ce projet a été approuvé par le comité d'éthique de la recherche de l'Université Laval sous le numéro 2007-073, le 24 avril 2007.
Je vous serai très reconnaissante pour votre précieuse et indispensable collaboration sans laquelle ce projet ne pourrait être mené à terme. J'aimerais aussi pouvoir débuter l'étude votre entreprise le plus rapidement possible et vous prie d'accepter mes salutations les plus distinguées.

Rafa Kouki
Candidate au Doctorat
Consortium de recherche For@c - CENTOR
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Pavillon Palasis-Prince
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Appendix 2- Interview Guide

Assimilation

1. Combien de modules son installés dans votre département ?
2. Utilisez-vous les rapports produits par le système?
3. Quels genres de décisions prenez-vous?
4. Quels processus de gestion utilisent/se basent sur le système ERP ?
5. Comment juger vous la capacité du système à soutenir vos tâches?
6. Utilisez-vous toutes les fonctions/possibilités du système ?
7. Si non, comptez-vous exploiter toutes les fonctions/possibilités du système prochainement ?
8. Comment jugez-vous **votre** capacité **à reconnaître la valeur du système** ERP pour vos fonctions et **à l'assimiler (l'accepter et l'utiliser)**?
9. Comment jugez-vous la capacité des **employés de votre département à reconnaître la valeur du système** ERP pour vos fonctions, **à l'assimiler (l'accepter et l'utiliser)**?
10. Pensez vous que les employés sont conscients et bien renseignés sur toutes les fonctions et les capacités du système ?
11. Selon vous, le système ERP ...
    - Vous permet d'accomplir vous tâches usuelles
    - Vous permet d'avoir un niveau élevé de contrôle sur vos fonctions
    - Vous permet d'obtenir les informations critiques sur votre entreprise
    - Vous permet d'identifier les tendances et d'obtenir des informations critiques concernant l'environnement de votre entreprise
    - Vous fournit des rapports qui sont utilisés pour prendre vos décisions

Facteurs

12. D'après vous quels attributs du système facilitent ou freinent votre utilisation (exploitation) du système à son plein potentiel? (flexibilité, modularité, …)

13. Jusqu'à quel degré le département de TI vous soutient dans votre utilisation du système?

14. Comment le département de TI vous soutient dans votre utilisation du système? (Maintenance, Consultation, Mise à Jour, Communication, etc.)

15. Comment jugez-vous l'expertise du département de TI
    - La capacité de faire la maintenance routinière de l'ERP
    - La capacité d'implanter et d'intégrer les mises à jour du système
    - La capacité technique de faire une validation formelle des changements du système
    - Suggestion d'idées sur la manière dont le système peut être utilisée pour réaliser les objectifs de l'entreprise

16. Jusqu'à quel degré est ce que la haute direction soutient le système?
    - Contacts avec l'équipe ERP
    - Fourniture des ressources suffisantes pour l'ERP (mises à jour, maintenance etc.)
    - Considération de l'ERP comme étant une partie de leur vision stratégique
    - Considération de l'ERP comme étant une priorité pour eux
    - Encourage les utilisateurs à acquérir des compétences de sources externes (user-groups, formation, forums, conférences, etc.)

17. D' après vous comment est-ce que la haute direction peut supporter encore plus l'assimilation du système?

18. Comment jugez-vous l'expérience de votre personnel avec les applications informatiques avant l'implantation de l'ERP ?

19. Est-ce que vos employés ont été formés pour bien utiliser le système?

20. Est-ce que vos employés sont régulièrement suivis afin de s'assurer qu'ils ont les compétences nécessaires pour utiliser le système?

21. Est-ce que l'entreprise possède des instruments (manuels, bases de données, fichiers, routines organisationnelles, etc.) où les informations sur ce qui a été appris dans des situations passées sont stockées?
22. Est-ce que votre entreprise a mis en place des procédures pour capter, codifier et disséminer les connaissances d'ERP par les individus (spécialistes techniques, consultants, etc.)?

23. Comment est-ce que les informations concernant l'ERP sont partagées (bulletins d'informations, les forums, les séminaires, etc.)?

24. Est-ce que vos suggestions et feedback ainsi que ceux de votre personnel sur l'ERP sont pris en considération par l'équipe ERP?

25. Avez-vous été consulté dès le début du projet concernant vos besoins particuliers?

26. Comment jugez-vous la capacité de votre système ERP à supporter la stratégie d'affaires de votre entreprise?

27. Comment jugez-vous la capacité de votre système ERP à supporter la stratégie d'affaires de votre entreprise?

28. Est-ce que vous examinez-vous continuellement les opportunités que les systèmes ERP peuvent offrir pour un avantage compétitif?

29. Est-ce que vos concurrents ont un système ERP? Si oui, est-ce que c'st le même que le votre?

30. Comment est ce que vos concurrents principaux qui ont adopté un ERP et ont eu un succès sont perçus dans l'industrie?
    Comment est-ce que ce que vos concurrents principaux qui ont adopté un ERP et ont eu un succès sont perçues par leurs clients et fournisseurs?

31. Existe-t-il des pressions (directes ou indirectes) de la part de vos fournisseurs principaux pour l'intégration et l'amélioration continues de votre système ERP? (Exigence de processus spéciales/des informations spécifiques à leurs besoins qui nécessitent l'ERP).

32. Existe-t-il des pressions (directes ou indirectes) de la part de vos clients principaux pour l'intégration et l'amélioration continues de votre système ERP?

33. Existe-t-il des pressions (directes ou indirectes) de la part de votre industrie (regroupement, association, etc.) pour l'intégration et l'amélioration continues de votre système ERP?

34. Quel est le degré d'adoption de vos fournisseurs et clients du système ERP

	Trop faible	Faible	Moyenne	Élevé	Trop élevé
Clients					
Fournisseurs					

35. Êtes-vous membres de corps professionnels, commerciaux ou d'affaires qui incitent et encouragent l'utilisation des ERP dans votre industrie?

36. D'après vous quels autres facteurs ont aidé ou freiné l'assimilation du système dans votre entreprise?

37. D'après-vous, qu'est ce qui serait nécessaire afin que l'assimilation du système s'améliore dans votre entreprise?

Appendix 3 - Consent Form

Formulaire de consentement

Présentation du chercheur

Cette recherche est réalisée dans le cadre du projet de doctorat de Rafa Kouki, dirigé par Diane Poulin de la Faculté d'Administration à l'Université Laval et Robert Pellerin à l'École Polytechnique de Montréal.

Avant d'accepter de participer à ce projet de recherche, veuillez prendre le temps de lire et de comprendre les renseignements qui suivent. Ce document vous explique le but de ce projet de recherche, ses procédures, avantages, risques et inconvénients. Nous vous invitons à poser toutes les questions que vous jugerez utiles à la personne qui vous présente ce document.

Nature de l'étude

La recherche a pour but d'étudier les facteurs clés de l'assimilation du système ERP à la phase post-implantation dans les entreprises manufacturières.

Déroulement de la participation

Votre participation à cette recherche consiste à participer à une entrevue, d'une durée d'environ une heure, qui portera sur les éléments suivants:

- éléments sur les facteurs qui facilitent ou contraignent l'assimilation du système ERP dans l'entreprise au niveau des gestionnaires dont les décisions ont impact sur les opérations manufacturières de l'entreprise;
- éléments sur la nature des décisions prises par ces gestionnaires;
- éléments sur le degré d'assimilation du système par ces gestionnaires.
- éléments sur l'impact de l'assimilation sur la performance de ces gestionnaires et de l'entreprise.

Avantages, risques ou inconvénients possibles liés à votre participation

Le fait de participer à cette recherche vous offre une occasion de faire le bilan de votre expérience ERP, d'avoir une idée des expériences d'autres entreprises manufacturières et de se comparer à celles-ci ;

Il n'y a aucun risque connu lié à la participation à la recherche

Participation volontaire et droit de retrait

Vous êtes libre de participer à ce projet de recherche. Vous pouvez aussi mettre fin à votre participation sans conséquence négative ou préjudice et sans avoir à justifier votre décision. Si vous décidez de mettre fin à votre participation, il est important d'en prévenir la chercheuse dont les coordonnées sont incluses dans ce document. Tous les renseignements personnels vous concernant seront alors détruits.

Confidentialité et gestion des données

Les mesures suivantes seront appliquées pour assurer la confidentialité des renseignements fournis par les participants:

- les noms des participants ne paraîtront dans aucun rapport;
- les divers documents de la recherche seront codifiés et seul la chercheuse et son assistant auront accès à la liste des noms et des codes;
- en aucun cas, les propos individuels des participants(es) ne seront communiqués à qui que ce soit;
- toutes les données ainsi que tout le matériel et les enregistrements seront détruits à la fin de la recherche;
- la recherche fera l'objet de publications dans des revues scientifiques, et aucun participant ne pourra y être identifié ou reconnu;
- un résumé des résultats de la recherche sera expédié aux participants qui en feront la demande en indiquant l'adresse où ils aimeraient recevoir le document, juste après l'espace prévu pour leur signature. Il est à noter que les résultats ne seront pas disponibles avant février 2008. Je devrais donc être tenue informé si l'adresse où faire parvenir les résultats changeait d'ici février 2008.

Renseignements supplémentaires

Si vous avez des questions sur la recherche ou sur les implications de votre participation, veuillez communiquer avec Diane Poulin-professeure, au numéro de téléphone suivant : (418) 656-3105, ou à l'adresse courriel suivante : diane.poulin@cirrelt.ulaval.ca et Rafa Kouki-étudiante-chercheuse, au numéro de téléphone suivant : (418) 527-5449 ou à l'adresse courriel suivante : rafa.kouki@centor.ulaval.ca

Remerciements

Votre collaboration est précieuse pour nous permettre de réaliser cette étude et nous vous remercions d'y participer.

Signatures

Je soussigné(e) _____consens librement à participer à la recherche intitulée : « Enterprise Resource Planning Post-implementation Assimilation Challenge : an integrative framework for a better post-implementation assimilation». J'ai pris connaissance du formulaire et j'ai compris le but, la nature, les avantages, les risques et les inconvénients du projet de recherche. Je suis satisfait(e) des explications, précisions et réponses que le chercheur m'a fournies, le cas échéant, quant à ma participation à ce projet.

_____ Date: _____

Signature du participant, de la participante

L'adresse à laquelle je souhaite recevoir un court résumé des résultats de la recherche est la suivante :

J'ai expliqué le but, la nature, les avantages, les risques et les inconvénients du projet de recherche au participant. J'ai répondu au meilleur de ma connaissance aux questions posées et j'ai vérifié la compréhension du participant.

_____ Date: _____

Signature du chercheur

Plaintes ou critiques

Toute plainte ou critique sur ce projet de recherche pourra être adressée au Bureau de l'Ombudsman de l'Université Laval :
Pavillon Alphonse-Desjardins
Bureau 3320
Université Laval,
Québec (Québec)
G1K 7P4
Renseignements - Secrétariat : (418) 656-3081
Télécopieur : (418) 656-3846
Courriel : ombuds@ombuds.ulaval.ca