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Studies on Adaptation to Information Systems: Multiple Roles and Coping Strategies

Christophe Elie-Dit-Cosaque

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STUDIES ON ADAPTATION TO INFORMATION SYSTEMS: MULTIPLE ROLES AND COPING STRATEGIES

BY

Christophe Max-Olivier ELIE-DIT-COSAQUE

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree

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ACCEPTANCE

This dissertation was prepared under the direction of the *Christophe Max-Olivier ELIE-DIT-COSAQUE* Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctoral of Philosophy in Business Administration in the Robinson College of Business of Georgia State University.

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ABSTRACT

STUDIES ON ADAPTATION TO INFORMATION SYSTEMS: MULTIPLE ROLES AND COPING STRATEGIES

BY

Christophe Max-Olivier ELIE-DIT-COSAQUE

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Committee Chair:

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Understanding individual adaptation to Information Systems (IS) has received relatively little attention in IS research. For furthering these issues, a multi-paper dissertation is adopted and studies distinct aspects of user interaction with IT related with adaptation. Thus, in order to better understand how system users adapt to IT disruptions this study examines (1) how system users who become disrupted by IS that provide them with too much information interact with these systems, (2) the influence of espoused cultural values (Srite et al. 2006) on user coping strategies of adaptation to IS, and (3) middle managers responses to the implementation of disruptive IT in public administration. These dissertation studies together help improve our knowledge on individual adaptive responses to IT disruptions.

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Chapter 1

Introduction Générale (FR)

Résumé

L'adaptation individuelle aux technologies de l'information (TI) a reçu relativement peu d'attention dans la recherche en systèmes d'information (SI). Afin de contribuer à une meilleure compréhension des problématiques que soulève ce concept, un format de thèse sur travaux est adopté. L'objectif est d'analyser des aspects distincts de l'interaction des utilisateurs avec les TI en lien avec la notion d'adaptation. Par conséquent, afin de mieux comprendre comment les utilisateurs de TI s'adaptent à ces dernières, cette étude examine (1) l'interaction d'utilisateurs avec une TI qui leur fournit différentes quantités d'information, en lien avec le succès de cette TI (1992) (2) l'influence des valeurs culturelles épousées (Srite et al. 2006) d'individualisme-collectivisme et d'évitement de l'incertitude sur les stratégies d'adaptation et de coping des individus face à l'implémentation d'une TI perturbatrice, (3) et, partant d'une conceptualisation basée sur les études d'Emirbayer et Mische (1998) et Crozier et Friedberg (1977), les actions mises en œuvre par des cadres intermédiaires lors de l'intégration d'une TI disruptive dans les unités locales d'une administration publique. Pour répondre aux questions de recherches qui sont posées, ces études adoptent des méthodologies quantitative expérimentale (études 1 et 2) et qualitative (étude 3) et entendent contribuer à améliorer notre compréhension des réponses des individus aux changements liés à l'introduction des TI.

1.1. Introduction

L'adaptation des utilisateurs aux technologies de l'information (TI) a été relativement peu étudiée et conceptualisée en Systèmes d'information (SI). Cela étant, des approches tenant à la fois de la tradition interprétativiste et de la tradition positiviste fournissent des éléments de réponse sur la façon dont les utilisateurs s'adaptent aux TI en cours d'implémentation.

Dans un article récent, Benbasat and Barki (2007) appellent à ce que de plus riches conceptualisations soient élaborées afin de mieux comprendre l'interaction des utilisateurs avec les TI. Précisément, ils reconnaissent que les comportements adaptatifs des utilisateurs demeurent sous-étudiés, et que la recherche en SI devrait analyser plus grande variété de comportements que ceux qui sont généralement envisagés dans les modèles d'acceptation et d'adoption de la technologie. Ils ajoutent qu'une trop grande focalisation sur l'acceptation aurait conduit les chercheurs à négliger de nombreux types de comportements liées à l'utilisation des systèmes, ce qui a en fait conduit à créer une « boite noire » de l'utilisation des TI. Cette inquiétude portant sur les comportements d'adoption avait déjà été entrevue par Bagozzi et al. (1992b).

L'objectif de cette thèse est donc, au travers de trois approches complémentaires, d'offrir une meilleure compréhension de l'adaptation des utilisateurs aux disruptions induites par les TI. Les articles qui la constituent emploient les méthodes quantitative expérimentale (Chapitres 3 et 4) et qualitative (Chapitre 5).

Ce chapitre introductif est structuré de la façon suivante : dans une première section, nous motivons la nécessité d'étudier l'adaptation des utilisateurs aux TI. Dans cette section, nous passons en revue quelques unes des approches les plus fréquemment mobilisées pour conceptualiser l'interaction des utilisateurs avec les TI et le succès des TI. Dans cette section, nous mettons en lumière le besoin de conduire des investigations autour du concept de

l'adaptation des utilisateurs aux TI. Dans une deuxième section, nous présentons un panorama de chacune des études qui constituent la thèse. Nous motivons les études et présentons leurs fondations théoriques ainsi que les méthodologies retenues pour répondre aux questions de recherche. En outre, nous en soulignons les complémentarités. Enfin, nous concluons par un tableau offrant une vision synthétique globale de chacune des études de la thèse.

1.2. Pourquoi étudier l'adaptation des utilisateurs aux TI?

1.2.1. Approches de l'adaptation

L'adaptation est définie comme un « processus selon lequel un être vivant se transforme pour s'acclimater au milieu qui lui est imposé » (Dictionnaire *Littré* 2006 p. 37). Le dictionnaire *American Heritage* définit l'adaptation comme le « changement dans le comportement d'une personne ou d'un groupe en réponse à un nouvel environnement ou à la modification de l'environnement ». Beaudry et Pinsonneault (2005) définissent l'adaptation de l'utilisateur comme « les efforts cognitifs et comportementaux mis en œuvre par les utilisateurs afin de gérer les conséquences spécifiques associées à un événement technologique important qui se produit dans leur environnement de travail » (p. 496). La définition de Beaudry et Pinsonneault (2005) est héritée du courant de la théorie de coping (Lazarus et al. 1984) et se rapproche donc de la définition du processus de coping. Lazarus et Folkman (1984) définissent le coping comme « les efforts cognitifs et comportementaux constamment changeants, mis en œuvre pour gérer des contraintes internes ou externes spécifiques, et qui sont évaluées comme ponctionnant ou dépassant les ressources de l'individu » (p. 174). Plus particulièrement, la théorie du coping (Lazarus et al. 1984) suggère que les individus engagent des efforts d'adaptation face à des demandes psychologiques ou environnementales induites par des événements stressants. La théorie du coping distingue deux types d'évaluations effectuées par les individus lorsqu'ils sont

confrontés à de telles situations. La première évaluation, ou évaluation primaire, consiste pour l'individu à estimer le degré de menaces et opportunités que fait peser l'événement stressant sur lui. La deuxième évaluation, ou évaluation secondaire, consiste pour l'individu à évaluer le niveau de contrôle que ses ressources personnelles lui permettent d'avoir sur la situation. A l'issue de ces évaluations de la situation, l'individu engage des efforts de coping ou d'adaptation. Le coping a deux formes. La première forme est focalisée sur les émotions, et consiste pour l'individu à diminuer la tension émotionnelle au travers de stratégies d'évitement et des comparaisons positives par exemple. La deuxième forme est focalisée sur la résolution du problème, et consiste pour l'individu à agir pour résoudre ce problème en tentant de le définir et de lui trouver des alternatives par exemple.

En outre, cette définition de l'adaptation, assez large, permet ainsi de recouper un ensemble de concepts autour du concept d'adaptation. En particulier, les concepts de réinvention des usages, d'appropriation de la TI, et d'ajustement, peuvent être considérés comme relevant de l'adaptation (Beaudry et al. 2005).

L'adaptation induit des changements émanant de l'individu, mais également un processus d'adaptation de la technologie aux tâches, opérés par l'individu ou par le designer des SI. Le besoin d'adaptation peut venir en effet d'écarts, notamment entre la technologie et les tâches (Goodhue et al. 1995) et / ou l'environnement de l'utilisateur (Leonard-Barton 1988). Ces écarts proviennent de la technique, du système de production, et des critères de performance (Leonard-Barton 1988). Selon Léonard-Barton (1988), le processus d'adaptation est nécessaire, parce qu'une innovation technologique, du fait bien souvent de sa complexité, n'est jamais parfaitement adaptée à l'environnement de l'utilisateur. En de telles circonstances, l'utilisateur d'un système qui ne serait pas aligné à ses tâches est susceptible d'être moins satisfait et moins performant dans l'exécution de ces dernières (Goodhue et al. 1995).

Ensuite, selon Léonard-Barton (1988), ces écarts peuvent être réduits grâce à un processus itératif conduisant à changer la technologie et / ou l'environnement d'utilisation. Enfin, l'adaptation devrait, selon le chercheur, être considérée comme neutre, sans préjuger d'aspects positifs de réinvention, ni d'aspects négatifs considérant l'adaptation comme une altération ou un contournement de la technologie. Bien qu'envisageant l'adaptation individuelle comme une altération de la technologie afin de l'adapter au mieux aux besoins de l'individu, voire comme un usage non prévu de la technologie, la perspective de l'adaptation mutuelle étudiée par Léonard-Barton (1988) se focalise principalement sur le processus d'implémentation et de mise en cohérence de la TI avec l'organisation.

Cela étant, l'adaptation individuelle, bien que n'étant pas toujours caractérisée comme telle, apparaît dans certaines études. Par exemple, Ahuja et Thatcher (2005) étudient l'essai d'innovation avec les TI comme variable de post-adoption. L'innovation avec les TI est définie comme un comportement consistant en l'altération de la technologie visant à faire cette dernière correspondre aux tâches de l'individu. L'effort de réinvention des usages (Rice et al. 1980) peut également paraître comme une forme d'adaptation individuelle, avec un comportement actif face au problème. En outre, l'infusion des technologies de l'information (Saga et al. 1994; Zmud et al. 1992) présente des similitudes avec la stratégie de maximisation des bénéfices présente dans le modèle de Beaudry et Pinsonneault (2005).

1.2.2. Apports et limites des recherches actuelles

Comme mentionné en introduction, la large domination des courants d'acceptation et d'usage de la technologies (ex: Davis et al. 1989; Venkatesh et al. 2003) a conduit à une très grande focalisation sur l'adoption des TI spécifiquement, au détriment d'autres types de comportements. Ce constat est notamment l'objet d'un numéro spécial de la revue *Journal of the Association for Information Systems* en 2007, où il est question d'identifier des voies d'amélioration, sinon

d'évolution de la recherche quantitative s'intéressant à ce type de problématiques. Parmi les constats formulés, il est possible de noter deux problèmes majeurs. Le premier est que, selon Benbasat et Barki (2007), les recherches appartenant au courant de l'adoption des systèmes d'information se sont trop limitativement ou trop longtemps intéressée au *Technology Acceptance Model*, ce qui a conduit à négliger des comportements autres que l'utilisation des systèmes spécifiquement. Ces auteurs, à l'issue de leur essai, encouragent par conséquent les chercheurs du domaine à dépasser ces focalisations trop restrictives. Selon eux, la recherche en SI gagnerait à davantage se focaliser sur des comportements sous-étudiés, tels les comportements de réinvention d'usage, d'adaptation, et les comportements relevant de la post-adoption des technologies.

A ce constat dressé s'ajoute celui de Straub et Burton-Jones (2007) qui considèrent que les recherches sur l'adoption des technologies de l'information se sont trop souvent contentées d'étudier l'utilisation des systèmes avec des mesures perceptuelles pauvres. En outre, il apparaît que ces mesures de l'utilisation des systèmes ont été peu remises en question malgré leurs lacunes (Burton-Jones et al. 2006). Dès lors, il apparaît important d'élaborer des mesures plus riches de l'utilisation des systèmes.

Ainsi, la recherche dans le domaine de l'adoption des technologies de l'information est souvent limitée du fait de postulats considérés trop restrictifs. En premier lieu, ces modèles postulent que l'utilisateur ne rencontrera pas d'entraves à son comportement d'utilisation d'une TI, que rien ne gêne son utilisation à partir du moment où il décide d'utiliser la technologie. Bagozzi et Warshaw (1990) et Bagozzi (1993) montrent qu'au contraire, le lien entre intentions et actions est plus problématique qu'il n'y parait, et recommandent de se focaliser sur des comportements orientés vers les buts, plutôt que vers les comportements d'usage spécifiquement.

En second lieu, les chercheurs utilisant le TAM postulent l'utilisation volontaire des systèmes. Comme suggéré par de nombreux chercheurs (ex: Lamb et al. 2003; Straub et al. 1995),

l'utilisation des systèmes est, le plus souvent, obligatoire dans les entreprises. Dans un contexte d'utilisation obligatoire de la technologie, les individus n'ont d'autre choix que d'engager des efforts adaptatifs afin d'intégrer la TI dans leurs pratiques de travail. Or, ces efforts adaptatifs ne sont que très peu étudiés. De plus, des chercheurs ont montré qu'il y a d'importantes différences dans les résultats obtenus par le modèle TAM lorsqu'appliqué à des SI dont l'utilisation est volontaire et des systèmes dont l'utilisation est obligatoire (Brown et al. 2002; Straub et al. 1995). Ces insuffisances contribuent probablement aux différences qui peuvent exister entre les résultats obtenus dans des conditions de recherche expérimentale et ceux obtenus et observés sur le terrain (Gallivan 2001; Lamb and Kling 2003; Straub et al. 1995). Dès lors, en ne prenant pas en compte ces aspects, de nombreuses recherches du domaine de l'adoption sont de nature à conduire à des résultats erronés.

De plus, il apparait que la recherche en systèmes d'information évolue suivant des clivages très tranchés, où des pans de recherche s'ignorent mutuellement. En particulier, il apparaît que la recherche qualitative interprétativiste et la recherche quantitative de type variance s'ignorent mutuellement (Beaudry et al. 2005). Selon Beaudry et Pinsonneault (2005), cette évolution séparée a conduit à développer des recherches parcellaires et fragmentées ne rendant finalement pas compte de façon suffisamment complète du phénomène de l'adaptation. Par conséquent, cette fragmentation de la recherche peut être considérée comme une faiblesse. Pourtant, certains chercheurs, tels Newman et Robey (Newman et al. 1992; Robey et al. 1996) ont par exemple montré que les recherches de type *variance* et *process* étaient complémentaires en mains aspects. Les recherches de type process sont de nature à expliquer la nature des liens formant des causalités, alors que les recherches de type variance établissent les causalités. C'est suite à ce type de préoccupations que Beaudry et Pinsonneault (2005) proposent le CMUA, un modèle de l'adaptation des utilisateurs intégrateur, offrant une synthèse des approches.

1.2.3. Quelques approches liées à l'étude de l'adaptation des utilisateurs aux SI

Comprendre les déterminants du succès des TI a été l'objet de nombreuses études dans la communauté académique en SI (e.g., DeLone et al. 1992; DeLone et al. 2003).

D'une part, il est possible d'identifier des études qui considèrent que des caractéristiques spécifiques des TI et des individus impactent l'utilisation des TI et, de façon sous-entendue, l'adaptation des utilisateurs. De telles théories telles que la *theory of planned behavior (Ajzen 1991)*, le modèle d'acceptation de la technologie (Davis et al. 1989), et la théorie unifiée de l'acceptation et de l'usage des technologies (UTAUT) (Venkatesh et al. 2003) fournissent des indications sur les raisons qui poussent les individus à adopter les TI et ce qui les conduit à une plus grande acceptation de ces dernières. Malgré l'intérêt des théories proposées jusqu'à présent, peu offrent une vision qui intègre l'adaptation des utilisateurs aux TI. La « boite noire » de l'utilisation des systèmes qui en résulte peut être représentée comme illustrée ci-dessous avec la Figure 1-1 (des détails additionnels et une discussion plus approfondies à ce sujet peuvent être trouvés dans le Chapitre 3 de la thèse).

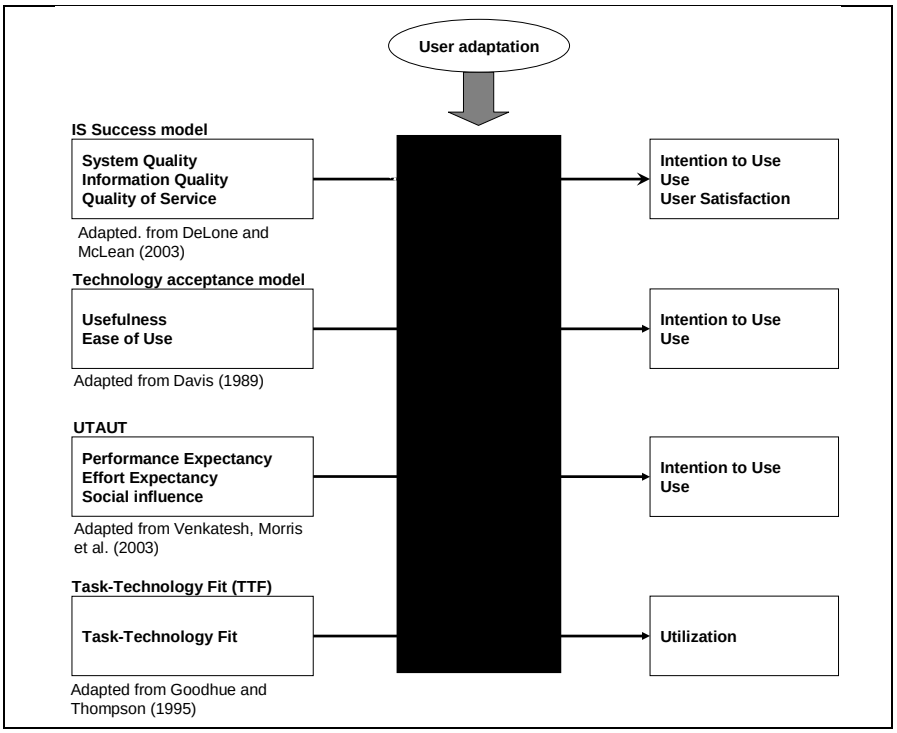


Figure 1-1. La boite noire des stratégies d'adaptation des utilisateurs

Ainsi, plusieurs études traitent de thématiques qu'il est possible de rapprocher de l'adaptation des utilisateurs des TI, sans pour autant traiter spécifiquement de ce sujet.

Il en est ainsi pour la théorie de l'alignement entre les tâches et la technologie proposée par Goodhue and Thompson (1995), théorie dans laquelle à la fois l'usage de la TI et son alignement avec les tâches des utilisateurs favorisent la performance individuelle avec les TI.

Le modèle du succès de la technologie (ISM) (DeLone et al. 1992; DeLone et al. 2003) articule en un modèle les déterminants du succès des SI, leurs impacts sur les comportements d'usage, et les contributions de la TI aux bénéfices nets (thématique discutée dans le Chapitre 2). Ainsi, le modèle du succès de la technologie pose des variables de qualité, précisément la qualité de l'information, la qualité du système et la qualité de service comme des déterminants du succès d'un SI.

La théorie de l'essai (Bagozzi et al. 1990) suggère que les individus doivent engager des efforts et peuvent être confrontés à des empêchements lorsqu'ils utilisent des SI. Plus tard, Ahuja and Thatcher (2005) ont proposé le construit de *Trying to innovate* comme type de comportement post-adoptif (Jasperson et al. 2005) où les individus tentent de trouver de nouvelles utilisations aux TI qu'ils ont à leur disposition. Ces comportements peuvent également mener à de nouveaux types d'usage où à des types d'utilisation de la technologie inattendus, au travers, notamment de la réinvention des usages (Boudreau et al. 2005). La théorie du *trying* intègre le fait que les individus doivent parfois faire des efforts au cours de leur interaction avec les TI, ce qui permet au concept de « *trying* » notamment de dépasser certaines limites du construit d'intention d'usage.

D'autres études se sont attachées à comprendre l'acceptation volontaire des SI, suivant une approche centrée sur l'utilisateur (Malhotra et al. 2005). L'approche de ces auteurs est basée sur la théorie de l'influence sociale (Kelman 1958) qui pose que les comportements individuels sont motivés par des objectifs et buts instrumentaux.

En dépit de ces résultats qui peuvent être liés à l'adaptation des utilisateurs, les chercheurs en SI n'ont cependant pas fourni de mesures qui permettraient d'étudier spécifiquement l'adaptation des utilisateurs. Il est donc nécessaire d'approfondir ces questions.

1.2.4. Adaptation et problématiques des mesures du succès des SI

Du fait que l'adaptation des utilisateurs joue probablement un rôle dans les comportements d'utilisation des systèmes, notre objectif est également de mettre les phénomènes adaptatifs en perspective avec des mesures traditionnelles du succès des systèmes.

Un courant de recherche s'est développé autour de la satisfaction des utilisateurs des TI. La satisfaction est conçue comme une mesure du succès des TI, particulièrement avec la notion de *user information satisfaction* (voir Chapitre 2). Ce construit est considéré comme une mesure subjective pertinente de l'utilisation des systèmes (DeLone et al. 1992; DeLone et al. 2003; Ives et al. 1983). Tout particulièrement, l'*utilisation* des systèmes est souvent mesurée subjectivement au travers de mesures auto administrées, qui peuvent mener à de sérieuses remises en cause de la véracité et la réalité de l'utilisation des systèmes sur le terrain (Burton-Jones et al. 2006; Gallivan 2001; Ives et al. 1983; Straub et al. 1995).

Par comparaison, *user information satisfaction* est une variable considérée comme étant mesurable, dans la mesure où il s'agit déjà d'une mesure subjective, ce qui permet d'éviter les biais méthodologiques mentionnés. Un certain nombre de conceptualisations, de développements de questionnaires, et de conseils méthodologiques ont été proposées dans la littérature portant sur

ce construit (Chin and Newsted 1995; Doll and Torkzadeh 1988; Doll and Torkzadeh 1991; Doll et al. 1994; Doll et al. 2004; Galleta and Lederer 1989; Ives et al. 1983; Torkzadeh and Doll 1991).

En outre, les approches émergentes sont présentées comme offrant une alternative à l'impératif organisationnel ou technologique (Markus et al. 1988). Ce type d'approches donne un plus grand rôle aux utilisateurs qui peuvent alors être vus également comme des acteurs sociaux (Lamb et al. 2003). Ces approches incluent notamment le modèle structurationnel de la technologie (Orlikowski 1992) qui se fonde sur la théorie de la structuration de Giddens (1984), la théorie de la structuration adaptative (DeSanctis 1994), la théorie de la structuration (Majchrzak et al. 2000) où les approches de l'agence humaine (Boudreau and Robey 2005; Crozier and Friedberg 1977; Emirbayer and Mische 1998). En comparaison avec les approches quantitatives expérimentales, ces courants de recherche se sont probablement davantage focalisés sur des thématiques se rapprochant de l'adaptation des utilisateurs aux SI. Cependant, les résultats obtenus sont souvent très spécifiques au contexte dans lequel ils sont obtenus, et par conséquent ne sont pas généralisables.

Par conséquent, malgré des indications réelles qui permettent une meilleure compréhension de l'adaptation des utilisateurs aux TI, l'absence d'approches transversales qui auraient permis d'exploiter la variété des résultats de chacune de ces traditions a été déplorée par certains chercheurs en SI (Beaudry et al. 2005; Benbasat et al. 2007). Tentant de réconcilier des résultats des traditions *variance* et *process*, Beaudry et Pinsonneault (2005) proposent un modèle de l'adaptation de l'utilisateur basé sur la théorie du coping (Lazarus et al. 1984). Les auteurs prennent en compte à la fois les approches variance et process afin d'élaborer un modèle global et intégrateur qui vise à comprendre comment les individus s'adaptent aux TI (voir le Chapitre 3). Leur approche se focalise donc sur les stratégies propres des utilisateurs des SI et va au delà de

conceptualisations selon lesquelles les croyances au sujet de la technologie influenceraient directement les comportements individuels.

1.2.5. Présentation des études de la thèse

Ces approches diverses de l'interaction des individus avec les TI visent le plus souvent à contribuer à une meilleure compréhension de ce qui fait qu'un système sera finalement utilisé et sera un succès. Ensemble, ces approches conduisent à des améliorations dans les organisations en informant les designers de SI sur certains des facteurs critiques du succès de ces systèmes.

Le Chapitre 3 se focalise sur la façon dont les utilisateurs à qui sont fournis des mécanismes adaptatifs insérés dans les SI qu'ils utilisent, s'adaptent à une quantité croissante d'information et à la surcharge informationnelle. Cette étude montre également comment un accroissement de la quantité d'information fournie impacte la qualité perçue de l'information et la satisfaction de l'utilisateur. Le modèle utilisé pour cette étude est le modèle du succès des SI (DeLone et al. 2003).

Le Chapitre 4 tente d'ouvrir la *boite noire* de l'utilisation des SI et tente de comprendre les stratégies d'adaptation mises en œuvre par les utilisateurs des SI. Dans cette étude, nous développons des mesures pour le CMUA (Beaudry et al. 2005) et analysons l'influence des valeurs culturelles épousées (Srite et al. 2006) dans le développement des stratégies adaptatives des utilisateurs.

Le Chapitre 4 vise à comprendre comment les cadres intermédiaires réagissent au changement technologique dans l'administration publique. Nous décrivons les actions prises par des responsables d'unités locales d'une administration publique gouvernementale, lors de l'implémentation d'un nouveau système d'information intégré. La théorie temporelle de l'agence

humaine (Emirbayer et al. 1998) et la théorie de l'acteur stratégique (Crozier et al. 1977) sont utilisées comme bases théoriques. L'approche retenue est une étude de cas qualitative.

Ainsi, la première étude s'attache à analyser comment les utilisateurs sont perturbés au cours de leur interaction avec une TI existante, alors que les deux études suivantes analysent les réactions des utilisateurs à l'introduction d'une nouvelle TI de nature à modifier significativement leur environnement de travail. D'une part, notre approche de l'adaptation nous conduit à analyser les modifications de comportements au cours de l'interaction avec une TI existante en fonction de paramètres changeants de la technologie. D'autre part, l'adaptation porte sur les efforts engagés par les utilisateurs conçus également comme des acteurs sociaux (Lamb et al. 2003) pour s'adapter à une nouvelle TI. Le Tableau 1.1 résume les questions de recherche qui sont abordées dans les études qui constituent cette thèse.

Tableau 1.1. Questions de Recherche

Chapitre 1	*Introduction générale de la thèse (en français)* ▪ Panorama des études composant la thèse.
Chapitre 2	*Introduction générale de la thèse (en anglais)* ▪ Panorama des études composant la thèse.
Chapitre 3	*Quantité d'information et succès du SI* ▪ Quels sont les effets de la qualité de l'information sur l'utilisation du système et la satisfaction de l'utilisateur? ▪ Se peut-il que des niveaux croissants d'information et l'incertitude liée à l'information aient des effets négatifs sur la qualité perçue de l'information ? ▪ Se peut-il que l'impact d'une quantité croissante d'information soit modéré par des mécanismes de filtration?
Chapitre 4	*Stratégies d'adaptation des utilisateurs aux technologies disruptives: mesures et impacts de la culture* ▪ Est-il possible de valider le CMUA en utilisant une approche variance et appliquée aux technologies disruptives ? ▪ Quelles influences ont les valeurs culturelles des utilisateurs sur la façon dont ils s'adaptent aux SI?
Chapitre 5	*Réponses managériales au changement TI dans l'administration publique* ▪ Quel rôle jouent les contraintes structurelles dans le développement des actions des managers en réponse à des environnements TI changeants dans l'administration publique? ▪ Quels rôles jouent les orientations temporelles des cadres intermédiaires dans la façon dont ils répondent au changement?
Chapitre 6	*Conclusions* ▪ Perspectives et contributions générales.

1.3. Présentation des études

1.3.1. Effets des caractéristiques du SI sur l'adaptation des utilisateurs

Dans le Chapitre 3, nous analysons l'influence de volumes d'information croissants sur l'adaptation des utilisateurs et sur la performance de leur prise de décision. Cette recherche se fonde sur le modèle du succès des SI (DeLone et al. 1992) et sur ses extensions (DeLone et al. 2003) qui offrent un cadre d'analyse pertinent pour l'étude du succès des SI (Rai et al. 2002).

En particulier, ce modèle pose des variables de qualité comme variables indépendantes, soit la qualité du système, de service, et de l'information dans l'explication du succès des SI. Selon la terminologie de DeLone and McLean, la qualité de l'information se réfère aux attributs de l'information en termes de contenu, d'exactitude, et de format requis par les utilisateurs. Ces attributs sont les aspects de la qualité les plus fréquemment étudiés dans la recherche en SI (Rai et al. 2002) et plus globalement dans la littérature managériale.

En outre il a été suggéré que les organisations qui considèrent les TI comme un actif stratégique gagnent à accroître le volume et la qualité d'information traitée afin d'améliorer la qualité des décisions prises et de contribuer à l'avantage compétitif (Porter et al. 1985). A cet égard, il est également indiqué qu'il est important de fournir aux salariés les outils facilitant l'organisation et le traitement de l'information.

Par ailleurs, plusieurs auteurs ont suggéré qu'afin de maintenir l'efficience du SI, ce dernier devrait être constamment adapté aux besoins et aux tâches des utilisateurs (Goodhue et al. 1995; Robey et al. 1981; Taggart et al. 1981). Cette adaptation est d'autant plus importante pour les managers et plus généralement pour les personnes dont les tâches sont essentiellement non-structurées et fortement basées sur des appréciations subjectives. En effet, il est plus difficile de

faciliter et d'automatiser de telles tâches via les SI (Mintzberg 1972). Plus particulièrement, la surcharge informationnelle peut être considérée comme étant un problème important (Eppler et al. 2004; Schultze et al. 1998) en ce que ce phénomène contribue à diminuer les performances individuelles (Ackoff 1967; Eppler and Mengis 2004; Hiltz and Turoff 1985; Keller and Staelin 1987) et influence négativement les comportements d'usage des TI.

Dans cette étude, nous analysons la surcharge informationnelle dans un contexte de prise de décision portant sur le choix d'un lecteur MP3 à acheter sur un site internet. Dans de telles circonstances, pouvoir disposer d'informations de bonne qualité est important pour prendre de bonnes décisions. Cependant, nous n'en savons que très peu au sujet de l'influence de la quantité d'information sur la qualité de l'information perçue par les individus, sur la qualité des choix effectués par ces derniers, et, finalement, sur le succès du système.

Par conséquent, la littérature offre peu d'indications sur les effets de la quantité d'information sur la qualité perçue de l'information et les comportements des utilisateurs. De questions de recherche significatives et non résolues à ce jour sont donc : (1) quels sont les effets de la perception de la qualité de l'information sur l'utilisation des systèmes et sur la satisfaction de l'utilisateur ? (2) Y a-t-il une influence négative du volume d'information fourni par le système et de l'incertitude du choix sur la qualité d'information ? (3) Se peut-il que l'impact de volumes croissants d'information soit modéré par des mécanismes de filtration ?

L'approche retenue est quantitative et expérimentale. 131 personnes ont pris part à cette étude. La tâche expérimentale a consisté en la prise d'une décision d'achat au sujet d'un lecteur MP3 à acheter pour un(e) ami(e). Ont été manipulées la quantité d'information (3 niveaux), et la présence ou non de mécanismes de filtration et de tris (2 niveaux), intégrés au site internet construit spécifiquement pour l'expérimentation. Les participants avaient à leur disposition un

tableau mentionnant les préférences de leur ami(e) à prendre en compte. Par la suite, il leur a été demandé de prendre une décision au sujet du lecteur MP3 qu'ils achèteraient.

La deuxième étude s'intéresse plus particulièrement aux stratégies d'adaptation des individus suite à l'implémentation d'un système ayant pour conséquence de fortement modifier l'environnement de travail. En outre, cette étude examine l'influence des valeurs culturelles épousées sur ces stratégies.

1.3.2. Stratégies d'adaptation individuelle en présence de technologies disruptives

Dans le chapitre 4, mon objectif est d'ouvrir la *boite noire* de l'utilisation des systèmes. Cette étude répond à l'appel de Benbasat and Barki (2007) pour le développement de conceptualisations plus riches autour de l'utilisation des SI. Cette étude vise à améliorer notre compréhension de la façon dont les utilisateurs s'adaptent aux technologies perturbatrices sur le point d'être implémentées.

Les technologies peuvent être considérées comme perturbatrices lorsqu'elles induisent des transformations radicales et profondes dans l'organisation (Lyytinen et al. 2003). A cette fin, nous nous fondons sur le coping model of user adaptation (CMUA) (Beaudry et al. 2005), un modèle expliquant les stratégies d'adaptation des utilisateurs comme résultant de leur évaluation d'un événement technologique et de leurs ressources pour faire face à ce dernier.

Dans une première évaluation, les utilisateurs analysent les impacts potentiels de la technologie en termes de menaces et opportunités spécifiques à la TI. Dans une deuxième évaluation, les utilisateurs analysent leur niveau de contrôle sur leur travail, leurs propres actions, et la technologie. Enfin, ils déterminent la stratégie d'adaptation la mieux à même de leur permettre de faire face à la situation. Ainsi, en fonction du niveau de menaces / opportunités véhiculé par la

technologie, et en fonction de la nature de leur contrôle sur la situation, les individus adoptent une stratégie d'adaptation parmi les quatre identifiées par Beaudry et Pinsonneault (2005). Ces stratégies sont: benefits maximizing, benefits satisficing, disturbance handling, et self-preservation.

Le premier objectif de cette étude est par conséquent de développer et tester des mesures visant à une meilleure compréhension des stratégies d'adaptation des utilisateurs aux TI. Le deuxième objectif de cette étude est de comprendre le rôle joué par les valeurs culturelles épousées (Srite et al. 2006) – l'évitement de l'incertitude, et l'individualisme-collectivisme – dans les stratégies mises en œuvre par les utilisateurs au cours de leur adaptation à des événements technologiques perturbateurs.

Notre conceptualisation de la culture s'est faite selon une perspective individuelle basée sur les valeurs (Leidner and Kayworth 2006; Srite and Karahanna 2006; Straub et al. 2002) et répond à certaines des critiques qui ont été formulées dans de nombreuses études multiculturelles précédentes, se basant sur les conceptualisations d'Hofstede (1980; 2001).

Les questions de recherche pour cette étude sont donc : (1) Peut-on valider empiriquement le CMUA en utilisant une approche de type variance ? (2) Quelle sont les influences des valeurs culturelles épousées par les utilisateurs sur la façon dont ces derniers s'adaptent aux systèmes d'information?

Une expérimentation en laboratoire 2x2 a été conduite avec 209 participants, en France et aux USA afin d'exploiter la diversité culturelle des personnes prenant part à l'expérimentation.

Le scenario expérimental présente l'implémentation d'un progiciel de gestion intégré (PGI) induisant des changements radicaux et profonds dans l'organisation fictive (Davenport et al. 1989; Hammer 1990). Le contexte d'utilisation est celui d'une utilisation obligatoire du système.

Les personnes de tendance individualiste tendent à mettre en avant leur intérêt personnel alors que les personnes de tendance collectiviste mettent en avant l'intérêt de leur groupe de référence en priorité (Hofstede 2001). Les personnes épousant des valeurs culturelles d'évitement de l'incertitude auront tendance à se détourner des situations teintées d'ambigüité et d'incertitude au profit de situations plus claires et structurées. Nous formulons dans cette étude des hypothèses selon lesquelles ces valeurs culturelles épousées impactent la façon dont les individus s'adaptent aux SI.

La troisième étude de cette thèse traite des réponses des cadres intermédiaires au changement technologique dans l'administration publique. Une étude qualitative a été menée afin de comprendre comment les cadres intermédiaires évaluent de nouvelles TI en cours d'implémentation et réagissent à ces dernières.

1.3.3. Stratégies d'adaptation managériale au changement technologique

La littérature en SI a fournit de nombreuses analyses soulignant les opportunités des TI pour les cadres intermédiaires (Mangaliso 1995; Millman et al. 1987; Pinsonneault et al. 1993). Nous explorons au chapitre 5 les actions prises par des cadres intermédiaires en vue de l'intégration d'un système d'information dans les pratiques de leur unité.

Il est souvent suggéré que les cadres intermédiaires sont des agents clés du changement stratégique (Balogun and Johnson 2004; Burgelman 1983; Leonard-Barton and Deschamps 1988; Rouleau 2005). Ce qui surprend, cependant, est que bien que ces derniers figurent parfois parmi les premiers bénéficiaires des TI implémentées (Leidner et al. 1999), les cadres intermédiaires semblent parfois faire partie de ceux qui sont les plus menacés par ces changements (Grey 1999; Millman et al. 1987; Pinsonneault et al. 1993). En fait, ces cadres subissent le changement stratégique autant qu'ils ont la responsabilité de le mettre en œuvre sur le terrain (Balogun et al.

2004). Au global, cependant, nous en savons relativement peu sur la façon dont ils promeuvent ce changement et s'y adaptent personnellement.

De nombreuses études font référence à des mécanismes d'adaptation personnelle à des événements technologiques. Les chercheurs ont adopté de nombreux cadres théoriques comme par exemple les approches cognitivistes et sociologiques (Vaast et al. 2005), la théorie de la structuration (Orlikowski 1992; Orlikowski et al. 1991; Yates et al. 1992), la théorie de la structuration adaptative (DeSanctis 1994). Ces théories, tout en mettant en exergue la complexité et la nature émergente des comportements humains dans les contextes d'implémentation des TI, s'accordent à affirmer que les individus peuvent à la fois poursuivre leur propre intérêt en mettant en œuvre des stratégies d'adaptation et répondre à leurs propres buts, en fonction des contraintes auxquelles ils font face. Cependant, peu analysent systématiquement les orientations temporelles des acteurs sociaux (Boudreau et al. 2005; Chu et al. 2008; Cousins et al. 2005), leur comportement parfois stratégique, et surtout l'agence humaine vis-à-vis de l'implémentation des TI. De fait, les comportements d'agence durant l'implémentation des TI ont été relativement peu étudiés dans ces courants de recherche. De fait, il n'y a pas de réel consensus sur les raisons qui font que les personnes parties prenantes d'un système d'information en acceptent les contraintes (Chu et al. 2008; Jones et al. 2008). Des avancées ont été effectuées dans le sens d'une réponse à ces questions dans plusieurs études récentes (Boudreau et al. 2005; Chu et al. 2008; Cousins et al. 2005), suivant l'approche de la théorie temporelle de l'agence humaine d' Emirbayer and Mische (1998).

Les organisations publiques ont été souvent présentées comme étant en retard dans le développement des TI (Thong et al. 2000). Cependant, ces organisations doivent aujourd'hui faire face à d'importants défis. En particulier, en partie pour répondre à la volonté de moderniser l'administration publique, de réduire les déficits publics, et d'accroitre la performance des

processus administratifs, des systèmes d'information de grande envergure sont implémentés. Ces systèmes d'information apparaissent comme des instruments clés de la réforme et de la modernisation de l'Etat (Arkwright et al. 2007; Assar et al. 2005). En effet, nombreux sont ceux qui voient dans les TI une opportunité pour améliorer les processus organisationnels internes et externes des administrations publiques. Malgré cela, la littérature en SI s'est relativement peu penchée sur les réactions et la contribution des cadres intermédiaires au changement technologique dans l'administration publique, dont certaines caractéristiques sont uniques (Bozeman et al. 1986; Fernandez et al. 2006; Grönlund et al. 2004; Rainey et al. 1976). Elle lui préfère, de loin, la grande entreprise privée américaine.

Au global, selon le rapport annuel sur l'état de la fonction publique 2007-2008, l'administration publique française représente 23% de l'emploi salarié et 21,3% de l'emploi total en France. Du fait de pressions croissantes liées au contexte macro-économique, ainsi que des normes et standards émanant pour certains de l'union européenne, les gouvernements tentent de réduire les coûts et d'améliorer la qualité et l'efficience des services rendus aux citoyens et aux organisations – de moderniser l'administration publique. Les cadres intermédiaires représentent une cible clé dans le cadre de ces programmes de changement des grandes administrations. Il est attendu d'eux qu'ils relayent sur le terrain le changement stratégique élaboré par les cadres dirigeants, en application des directives votées par les élus. Il est donc nécessaire, d'examiner plus en détail comment les cadres intermédiaires réagissent au changement technologique stratégique dans l'administration publique. Cela apparait fondamental afin de mieux comprendre leurs besoins, craintes, et anxiété qui peuvent apparaitre durant l'implémentation des TI, et de favoriser le succès de ces technologies dans le cadre de la modernisation de l'administration publique.

Partant de la théorie temporelle de l'agence humaine (Emirbayer et al. 1998) et de la théorie de l'acteur stratégique (Crozier et al. 1977), notre objectif dans cette étude est d'approfondir nos connaissances sur la façon dont les cadres intermédiaires s'adaptent au changement technologique.

Ainsi, les questions de recherche auxquelles nous répondons dans cette étude sont les suivantes : 1) Quels rôles jouent les contraintes structurelles dans le développement des réponses et actions managériales dans un contexte d'implémentation des TI dans l'administration publique 2) Quels rôles les orientations temporelles des cadres intermédiaires jouent-elles dans la formulation de leurs réponses au changement technologique?

Afin de répondre à ces questions de recherche, nous avons employé une étude de cas interprétativiste (Klein et al. 1999). Cette étude de cas traite de l'implémentation d'un grand système intégré dans des unités locales d'une administration publique gouvernementale. Le système implémenté, BSYS, remplace et intègre de multiples systèmes disparates afin d'améliorer la gestion des finances locales mais aussi le service rendu aux partenaires extérieurs et aux citoyens. Au total, 15 cadres intermédiaires ont été interviewés, ainsi que plusieurs informateurs.

1.4. Conclusions

Cette thèse analyse de multiples facettes de l'adaptation des utilisateurs aux TI et leur connexion au succès des TI. L'objectif est de parvenir à une meilleure compréhension de ce phénomène et attire l'attention sur le besoin d'enrichir nos études dans le domaine de l'adoption et de l'acceptation des TI. Le Tableau 1.2 offre un résumé de la présentation des trois études de la thèse.

Tableau 1.2. Perspectives des études

	Chapitre 2: Quantité d'information et succès du SI	Chapitre 3: Comprendre les stratégies d'adaptation des utilisateurs en présence de technologies disruptives	Chapitre 4: Stratégies d'adaptation managériale au changement technologique dans l'administration publique
Objectifs	▪ Etude de l'adaptation des utilisateurs à l'accroissement de la quantité de l'information fournie. ▪ Etude de l'influence de la quantité d'information sur le succès du système d'information.	▪ Etudie l'adaptation des utilisateurs face aux événements technologiques perturbateurs. ▪ Etude de l'influence des valeurs culturelles épousées sur les stratégies d'adaptation des utilisateurs.	▪ Etude de l'adaptation managériale au changement technologique dans des unités locales d'une administration publique.
Domaine	▪ Interaction des utilisateurs avec un site internet	▪ Implémentation d'un progiciel de gestion intégrée ▪ Etude multiculturelle	▪ Implémentation de grands systèmes intégrés. ▪ Contexte d'administration publique
Bases théoriques	▪ Modèle du succès du système d'information (DeLone and McLean 2003)	▪ Coping Model of User Adaptation (Beaudry and Pinsonneault 2005) ▪ Valeurs culturelles épousées (Srite and Karahanna 2005)	▪ Théorie temporelle de l'agence humaine (Emirbayer and Mische 1999) ▪ Théorie de l'acteur stratégique (Crozier and Friedberg 1977)
Méthodologie	▪ Etude quantitative ▪ Design expérimental	▪ Etude quantitative ▪ Design expérimental	▪ Etude qualitative ▪ Etude de cas interprétativiste
Echantillon / matériau de recherche	▪ 131 participants	▪ 209 participants	▪ 15 cadres intermédiaires et 12 informateurs
Lien	▪ Utilisateur perturbé par l'accroissement de la quantité d'information fournie par le système. ▪ Etude des réactions face à l'accroissement du volume d'information fournie par le système.	▪ Utilisateur perturbé du fait de l'introduction d'une TI. ▪ Etude des stratégies d'adaptation face aux menaces et opportunités du système.	▪ Acteur social perturbé du fait de l'introduction d'une TI. ▪ Etude de l'adaptation aux contraintes et aides fournies par le système.

Chapter 2 General Introduction (EN)

Abstract

Understanding individual adaptation to Information Systems (IS) has received relatively little attention in IS research. For furthering these issues, a multi-paper dissertation is adopted and studies distinct aspects of user interaction with IT related with adaptation. Thus, in order to better understand how system users adapt to IT disruptions this study examine (1) how system users who become disrupted by IS that provide them with too much information interact with these systems, (2) the influence of espoused cultural values (Srite et al. 2006) on user coping strategies of adaptation to IS, and (3) middle managers responses to the implementation of disruptive IT in public administration. These dissertation studies together help improve our knowledge on individual adaptive responses to IT disruptions.

2.1. Introduction

Whereas both positivist and interpretivist traditions have looked at how users adapt to information technologies (IT), the topic has, overall, been little studied and lightly conceptualized in IS research. Recently, in fact, Benbasat and Barki (2007) call for richer models and conceptualizations for understanding user interaction with IT. Namely, they suggest that user adaptive behaviors remain understudied, and that researchers should focus on a wider range of behaviors than what is currently offered in acceptance models. They further argue that an overly strong focus on acceptance has led researchers to neglect a wide range of behaviors related to system usage, in fact creating a "black box" of system usage, a concern shared by Bagozzi et al. (1992b). The purpose of the current dissertation is thus to offer a better understanding of user adaptation to IT. In doing so, we adopt multiple complementary approaches.

Specifically, in Chapter 2, we show how system users become disrupted by large amounts of system-provided information and how this subsequently affects their purchasing intentions. In Chapter 3 we study system user strategies of adaptation to work environments disrupted by IT. Finally, in Chapter 4, we study how middle-managers respond to disruptive IT implementation in public administration.

Additionally, the articles/papers in this dissertation apply both quantitative (Chapter 2 and Chapter 3) and qualitative methodologies (Chapter 4). By offering diverse methodological approaches, we provide complementary views on how system users respond to IT related disruptions.

This introduction to the dissertation is organized as follows: in the first section, I motivate the need for studying user adaptation to IT. Here I discuss some of the most frequent approaches

that have been applied to user interactions with IT and IS success, a point which highlights the need for further investigations into the concept of user adaptation to IT. In the second section, I present an outline of each of the dissertation chapters. Next I motivate the studies, outlining their theoretical backgrounds as well as their methods. Finally, I conclude with a summary table that offers an overview of each study in the dissertation.

2.2. Why Study User Adaptation to IT?

2.2.1. Piecemeal Approaches Related with User Adaptation

Understanding what makes IT successful has been of considerable interest to the IS community for decades (e.g., DeLone et al. 1992; DeLone et al. 2003). In this quest, researchers have studied how system user behavior is related to user adaptation, but few have specifically analyzed user adaptations.

On the one hand we can find studies that examine specific characteristics of the technology and how this will impact individual IT usage and adaptation. Such theories as the theory of planned behavior (TPB)(Ajzen 1991), the technology acceptance model (TAM) (Davis 1989), and the unified theory of acceptance and usage of technology (UTAUT) (Venkatesh et al. 2003) provide insights into why people adopt a technology, and what leads them toward a greater acceptance of IT.

Notwithstanding the insightfulness and explanatory power of the theories proposed to date, there have been no real attempts to integrate user adaptation to IT into these streams of work. As earlier stated, this created a black box between antecedents and system usage as depicted as in Figure 2-1 (additional details and discussions can be found in Chapter 3 of the dissertation).

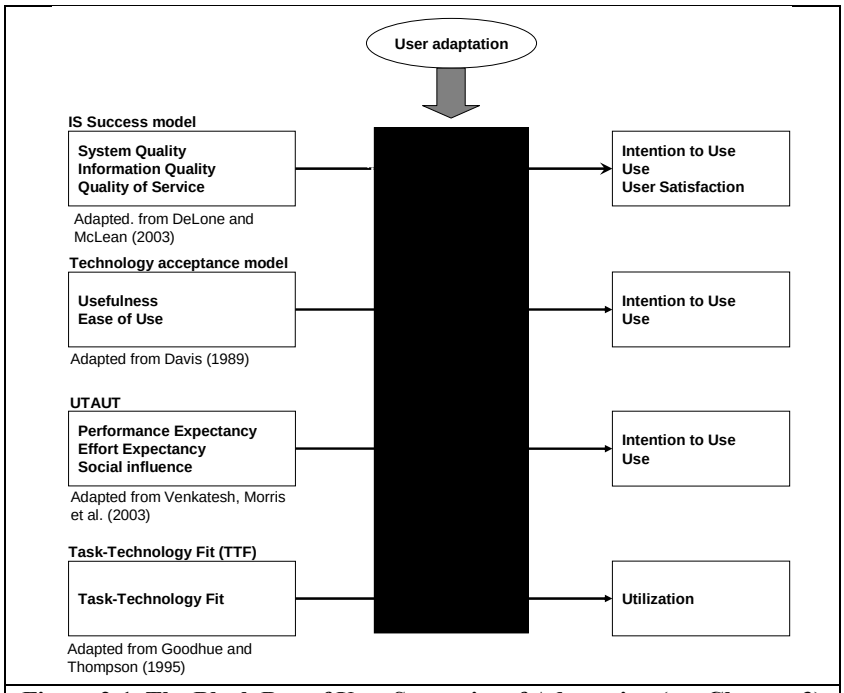


Figure 2-1. The Black Box of User Strategies of Adaptation (see Chapter 3)

This not to say that there are no theories that can be linked to the concept of user adaptation, although they do not deal specifically with this concept. For example, Goodhue and Thompson (1995) have suggested a task-technology fit theory in which both the use of an IT and the fit of that IT with user tasks yields greater individual performance with IT.

Another related piece of work is the information success model (ISM) (DeLone et al. 1992; DeLone et al. 2003) which articulates the determinants of IS success and their impacts on use behavior and on the contribution of IT to net benefits (discussed in Chapter 2). The IS success model sets forth quality measures, information quality, system quality and quality of service as determinant of the success of an IS.

Moreover, other theories also deal with the way users interact with systems. The theory of Trying (Bagozzi et al. 1990) suggests that individuals need to make efforts and can face impediments in the course of usage. Ahuja and Thatcher (2005) suggest that *trying to*

innovate was a kind of post adoptive behavior (Jasperson et al. 2005) whereby individuals attempt to find new patterns of use of technology at hand. This can also lead to novel or unexpected patterns of system usage through, for example, reinvention (Boudreau et al. 2005). The theory of trying thus recognizes that individuals sometimes need to make efforts in their interaction with IT, which goes beyond the construct of intention to use (this issue is discussed in Chapter 3 dealing with IT users coping strategies of adaptation).

In different ways, approaches advanced to date have also tried to understand user volitional acceptance of IS from a user-centered perspective (Malhotra et al. 2005). The basis for these authors the theory of social influence (Kelman 1958), which posits that individuals behaviors are mainly led by instrumental goals and objectives.

In spite of various findings that can be related to the essential concept of user adaptation, researchers have yet to develop measures that would allow studying user adaptation specifically. Indeed, extent research often provides measures of system success, which are, unarguably, of the greatest importance for our field, but these are far from measures of user strategies of adaptation. This makes it imperative to further investigate this issue.

2.2.2. Measures of System Success Orthogonal to Those of User Adaptation

Measures of system success are orthogonal to user adaptive strategies. What is also problematic about the system usage constructs that capture system success is that they are not rich enough to tap into the essence of many usage behaviors. In line with the concerns of Benbasat and Barki (2007) and that of Straub et al. (1995) about system usage, Burton-Jones and Straub (2006) propose new and richer ways of conceptualizing system usage, depending on the technology being studied. Indeed, system usage has often been conceptualized as though lean measures are not problematic (Straub et al. 1995). This raises the spectre that there are important differences between subjects' responses and the reality of system usage in

organizations (Straub et al. 1995). Since, we will argue, user adaptation likely plays a role in system usage behavior, it is critical to examine this concept along with traditional measures of system success like systems usage.

To be sure, a stream of research has developed focusing on user satisfaction with IT as another surrogate measure for system success, especially user information satisfaction (see Chapter 2). This construct has been argued to be a relevant subjective measure of system success (DeLone et al. 1992; DeLone et al. 2003; Ives et al. 1983). Whereas system usage is often assessed subjectively through self-reports, which can lead to serious concerns about the veracity of actual system usage (Burton-Jones et al. 2006; Ives et al. 1983; Straub et al. 1995), user information satisfaction has been a better studied IS success outcome.. A number of conceptualizations, questionnaire developments, and methodological advices have been proposed in the IS literature dealing specifically with this construct (Chin et al. 1995; Doll et al. 1988; Doll et al. 1991; Doll et al. 1994; Doll et al. 2004; Galleta et al. 1989; Ives et al. 1983; Torkzadeh et al. 1991).

Alternatively, emergent approaches are said to provide another way to think about the organizational and technological imperative (Markus et al. 1988), giving a larger role to users who should also be seen as social actors(Lamb et al. 2003). These approaches include the structurational model of technology (Orlikowski 1992), a model that relies on the structuration theory of Giddens (1984), adaptative structuration theory (DeSanctis 1994), structuration theory (Majchrzak et al. 2000) or human agency approaches (Boudreau et al. 2005; Crozier et al. 1977; Emirbayer et al. 1998). In comparison to quantitative and experimental research, these streams of research focus more on topics associated with adaptation to IS. However, these findings are often very specific to the context in which they were studied and therefore do not provide highly generalizable conclusions.

Thus, while there has been some progress toward a better understanding of user adaptation to IT, IS researchers from the different traditions have studied user adaptation without a universal approach that would permit exploiting the variety of findings from each of the traditions (Beaudry et al. 2005).

Trying to reconcile insights from variance and process approaches, Beaudry et al. (2005) suggest a model of user adaptation that is based on the theory of coping (Lazarus et al. 1984). They attempt to integrate variance and process approaches in order to elaborate a global model for understanding how individuals interact with IT (see Chapter 3). Their approach focuses on users' internal strategies of adaptation and goes beyond a view that beliefs about the technology itself directly influencing individual behaviors.

2.2.3. Rationale of the Dissertation Papers

These various approaches of user interaction with IT all aim at factors that predict whether a system will or will not be used and subsequently successful. Together, they lead to improvements in organizations by informing system designers about the critical factors of system success. In this dissertation I focus on individual user responses and how, in the course of their work tasks, they integrate IT.

Chapter 2 focuses on how individuals provided with system-embedded coping mechanisms respond to increases in information quantity, a condition known as information overload. This study also shows how information quantity impacts perceived information quality and satisfaction variables in the IS success model (DeLone et al. 2003).

Chapter 3 attempts to open the black box of system usage and user adaptation and attempts to explore how users adapt specifically to disruptive systems like ERPs. In this study, we develop measures for the coping model of user adaptation (Beaudry et al. 2005) and analyze

the influence of espoused cultural values (Srite et al. 2006) as users develop and enact their user adaptive strategies.

Finally, ***Chapter 4*** adopts a qualitative approach to understand managerial responses to IT constraints and enablement during the implementation of a disruptive IT. We describe the case of the implementation of a large integrated system being implemented in local government units. This is a situation where middle-managers are expected to deploy the system on the field and to warranty its implementation. The temporal theory of human agency (Emirbayer et al. 1998), the strategic actor theory (Crozier et al. 1977) and the structurational model of technology (Orlikowski 1992) are used as theory bases for explaining the role of IT in managerial enactment and human agency during IT change. Table 2-1 below summarizes the research questions addressed in each dissertation chapter.

Table 2.1. Research Questions Addressed in the Dissertation

Chapter 1	General Introduction of the Dissertation ▪ Overview of the papers making up the dissertation.
Chapter 2	Information Quantity and IS Success ▪ What are the effects of information quality on system usage and user satisfaction? ▪ Do increasing amounts of system-provided information and information uncertainty have detrimental effects on information quality? ▪ Can the impact of increasing amounts of information be mitigated by filtering mechanisms?
Chapter 3	User Strategies of Adaptation to Disruptive IT; Measures and Cultural Impacts ▪ Is there empirical support for CMUA (using a variance approach) as applied to the setting of disruptive IT? ▪ What influence do user cultural values have on how they adapt to systems?
Chapter 4	Managerial Responses to IT Change in Public Administration ▪ What role do structural constraints play in the development of managers' enactments and responses to changing IT environments in public administration? ▪ What roles do middle managers temporal orientations play in the formulation of their responses to IT change?
Chapter 5	Conclusion ▪ Perspectives and Concluding Remarks.

Thus, the first study focuses on how information overload can be perceived as a disruptive system by individuals, while the two other studies examine how individual users respond to the implementation of new, inherently disruptive IT that threatens to modify their work environment. On the one hand, our approach leads us to examine user interactions with an

existing IT, while they are provided with various amounts of information. On the other hand, our approach to adaptation focuses on the efforts made and actions taken by system users who also conceived of as social actors (Lamb et al. 2003) as they adapt to a new, disruptive IT.

2.3. Overview of the Multiple Papers

2.3.1. The Effects of the IS Characteristics on Users' Adaptation

In Chapter 2, we investigate the influence of increasing information load IS success. The research relies on the DeLone and McLean IS success model (ISM) (DeLone et al. 2003) as its foundational base.

ISM (DeLone et al. 1992) and its further refinements (DeLone et al. 1992; DeLone et al. 2003) offer a consistent framework for understanding IS success (Rai et al. 2002; Seddon 1997). In particular, IS quality variables are set forth in this model as independent variables, namely system, service, and information quality. In DeLone and McLean's terminology, information quality refers to attributes of information such as the content, accuracy, and format needed by users. These attributes are among the most frequently studied aspects of quality in the IS literature (Rai et al. 2002) as well as in managerial literature. However, little is known about the influence of increasing amount of system provided information, which results in a gap in our knowledge of the impacts of information quantity on IS success.

In fact, it has been suggested that organizations that consider IT to be a strategic asset increase both the volume and quality of information in order to improve users' decision making and competitive advantage (Porter et al. 1985) and provide workers with tools that make organizing and processing information easier. Additionally, several authors suggested that in order to maintain the efficiency of the system, it should be constantly adapted to user needs or

tasks (Goodhue et al. 1995; Robey et al. 1981; Taggart et al. 1981). This is all the more true for managers or more generally for those whose tasks are mainly unstructured and subjective, which makes it even more difficult to facilitate daily work tasks via IS (Mintzberg 1972). In particular, information overload can be considered to be a problem (Eppler et al. 2004; Schultze et al. 1998) in that it can diminish individual performance (Ackoff 1967; Hiltz et al. 1985) or affect usage behaviors with respect to the system. However, by studying the information quantity issue, in general, and information overload, in particular, in isolation from other IS success variables, IS researchers probably paid too little attention to this parameter (Eppler et al. 2004).

In the present study, we investigate the impacts of information quantity on quality variables and IS success, in the context where individuals have to make a decision about a product to purchase on a website. In such circumstances, having information of good quality is important for making good decisions. However, we know little about the influence of information quantity on perceived quality and, eventually, on the success of the system.

Thus, regarding information quality, there is little guidance in the literature regarding the effects of the volume of information provided on users' behaviors and on the success of an IS. Significant unanswered research questions, therefore, are: (1) what are the effects of information quality on system usage and user satisfaction? (2) Do increasing amounts of system-provided information and information uncertainty have detrimental effects on information quality? (3) Can the impact of increasing amounts of information be mitigated by filtering mechanisms?

A quantitative study using a web-experimental design was conducted with a sample of 131 student subjects. The experimental task consisted of making a decision about buying an MP3 player. We manipulated the quantity of information (3 levels) and the presence or not of

filtering and sorting capabilities embedded in a website specifically designed for the study. Subjects were provided with a table with a friend's preferences to be taken into account, and were then asked to make a decision about which MP3 player to buy.

Prior research manipulated information quantity by varying the number of alternative and or / attributes (e.g., Keller et al. 1987; Lee et al. 2004), and we rely on these studies in our conceptualization.

What are users' strategies of adaptation of individuals in the course of their interaction with a system? The second study specifically tackles this question and dwells on the strategies implemented by users of a new disruptive IT. It also examines the influence of espoused cultural values on these strategies.

2.3.2. Users' Adaptation Strategies in the Presence of Disruptive IT

In Chapter 3, our aim is open the black box of system usage and user adaptation strategies, following the call of Benbasat and Barki (2007) to develop richer conceptualizations around system usage. This study increases our understanding of how users cope with disruptive ERP that is in the process of being implemented.

Disruptive technologies are those which involve radical and pervasive changes in the organization (Lyytinen et al. 2003). For that purpose, we rely on the coping model of user adaptation (CMUA) (Beaudry et al. 2005), a model that explains user strategies that result from appraisals of the IT event. These strategies are a response to user appraisal of the technology and to the level of control he/she has over the situation. In a first appraisal, users evaluate the potential impacts of the technology in terms of threats and opportunities embedded in the IT event. In a secondary appraisal, users evaluate their level of control over their work, self and technology. Then, they determine their strategies of adaptation.

The first purpose of this study, therefore, is to develop and test measures for a deeper understanding of user adaptation to IT following the CMUA. The second purpose of this study is to understand the role played by espoused cultural values (Srite et al. 2006) – that is, the cultural values of espoused uncertainty avoidance and espoused individualism-collectivism embedded in the strategies users adopt in order to cope with IT events.

Our conceptualization of culture has been framed as an individual perspective based on values (Leidner et al. 2006; Srite et al. 2006; Straub et al. 2002) and responds to some of the criticisms on previous multicultural studies relying on Hofstede's (1980; 2001) conceptualizations.

The research questions for this paper are: (1) is there empirical support for CMUA (using a variance approach) as applied to the setting of disruptive IT? (2) What influence do user cultural values have on how they adapt to systems?

A 2x2 laboratory experiment was carried out in France and the in the USA with 209 student subjects. In this way, we were able to exploit the cultural diversity of subjects taking part in the experiment.

The experimental scenario describes the implementation of an Enterprise Resource Planning (ERP) system. Since ERPs often involve radical and pervasive change in an organization(Davenport et al. 1989; Hammer 1990), they qualify as disruptive (Lyytinen et al. 2003). The context is thus that a mandatory usage scenario. Several authors have shown that individuals can either resist or be willing to use such systems depending on what they perceive it conveys in terms of threats and opportunities (Boudreau et al. 2005; Vaast et al. 2005). Given the various challenges posed by ERP systems, we thus decided to study it as disruptive IT.

The third study in this dissertation deals with middle-managerial responses to IT change in a public administration context. This qualitative study sought to understand how managers appraise new IT being implemented and react to it.

2.3.3. Managerial Adaptation Strategies to IT Change

There is widespread evidence in the IS literature (Mangaliso 1995; Millman et al. 1987; Pinsonneault et al. 1993) of the opportunities afforded by information technologies (IT) with respect to the work of middle-managers. There is an emerging agreement among researchers that the capabilities provided by IT often lead to improvements in decision making performance and more accuracy in work.

The present research aims to explain how middle-managers respond to disruptive IT constraints and enablement in a public administration setting. We do so with a qualitative case study in a public administration setting.

Middle-managers are often said to act as key agents in strategic change (Balogun et al. 2004; Burgelman 1983; Leonard-Barton et al. 1988; Rouleau 2005). They might be viewed, in fact, as being on the front line with regard to changes wrought by IT. What is surprising, however, is that while they are among the major beneficiaries (Leidner et al. 1999), they are also among those potentially most threatened by these changes (Grey 1999; Millman et al. 1987; Pinsonneault et al. 1993). In fact, they are often receivers of strategic change directives, as well as having the responsibility to implement it (Balogun et al. 2004). In addition, they are also considered to be in the best position to contribute to the most effective implementation of those technologies (Currie et al. 2002; Jackson et al. 1994; Larsen 1993; Larsen et al. 1999; Pinsonneault et al. 1993). Overall, the piecemeal evidence about how middle-managers respond to IT change suggests that little is known about the exact ways in which they carry forward IT change, and how they personally adapt to it. Specifically, why and how

individuals respond to IT constraints remains an unresolved issue in IS research (Boudreau et al. 2005; Chu et al. 2008).

In the emergent tradition of research, system outcomes are often said to emerge unpredictably from given IT and social contexts (Markus et al. 1988). In this stream, research based on structuration theory of Giddens (1984) has been particularly prolific (Boudreau et al. 2005; Jones et al. 2008; Orlikowski 1992; Orlikowski 2000). In spite of these many studies, researchers argue that IS research in the qualitative tradition of research has often failed to provide a precise view of micro dynamics of human action during IT implementation (Thompson 2004; Vaast et al. 2005). For that, in studying responses to disruptive IT in public administration, our attempt has been to offer a deeper explanation on human agency in public middle-managers.

IT can be framed through the lens of enabling and constraining features (Orlikowski 1992). A great concern of structuration research has been to study how individual users respond to these enablement and constraints (Jones et al. 2008). However, this has been done without a good understanding of human agency, which remains under-theorized in structuration research (Chu and Robey 2008; Jones and Karsten 2008). A step forward in addressing these issues has been made recently in several studies (Boudreau et al. 2005; Chu et al. 2008; Cousins et al. 2005), following the temporal theory of human agency of Emirbayer and Mische (1998). So far, however, no attempts have been made to specifically describe middle-managers temporal orientations and how these shape their responses to disruptive IT implementation.

Of course, several studies mention, at least to some extent, individual strategies for IT implementation. For example, researchers have adopted a number of cognitive and sociological theoretical frameworks (Vaast et al. 2005), structuration theory (Orlikowski

1992; Orlikowski et al. 1991; Yates et al. 1992), adaptative structuration theory (DeSanctis 1994), and a synthesis of structuration theory and adaptative structuration theory (Majchrzak et al. 2000). All of these theories agree that individuals may both regard their own interest in enacting strategies and respond to their own instrumental goals, depending on the constraints they face. However, few systematically analyze actors' temporal orientations(Boudreau et al. 2005; Chu et al. 2008; Cousins et al. 2005), strategic behavior at times, and human agency with respect to IT implementation at a micro level (Vaast et al. 2005).

We had a particular interest in French public administration. Indeed, this is an evolving field where important changes occur in what is usually called the modernization of public administration. Overall, French public administration accounts for more than 25% of working population. With increasing macroeconomic pressures and public expenses norms and standards from the European Union, governments attempts to cut costs and to improve public service to citizens and organizations.

Furthermore, public organizations face important challenges and are ready sources of projects where IT is being introduced. While these organizations are often presented as being late in developing IT (Thong et al. 2000), numerous managers see IT as an opportunity to improve internal as well as external organizational processes. In spite of this, the IS literature has paid relatively scant attention to individual adaptation to IT change in public organizations, organizations which have unique characteristics that are worth being taken into account (Bozeman et al. 1986; Grönlund et al. 2004). Middle-managers are an important force in public administration, probably because of their capability to enact in the field the strategic changes mandated by top management, in compliance with directions set forth conjointly with elected politicians. For that, they are a key target in training programs in public administration.

For all these reasons, our aim in this study was to offer an improved conceptualization of middle-managers responses to IT strategic change in public administration. More specifically, following the temporal theory of human agency (Emirbayer et al. 1998) and strategic actor theory(Crozier et al. 1977), our goal was to gain knowledge into how middle-managers respond to IT constraints.

Thus, the research questions we expect to address in this chapter are: (1) What role do structural constraints play in the development of managerial enactments and responses to changing IT environments in public administration? (2) What roles do middle managers temporal orientations play in the formulation of their responses to IT change?

To answer these research questions, we adopted an interpretive case study methodology (Klein et al. 1999). The case study examined the implementation of a large integrated IT in geographically distributed local units of a large government administration. The implemented system, BSYS, replaces and integrates multiple disparate systems in order to improve public accountancy. The key expectation of system designers was to dramatically increase the quality of public accountancy, services delivered to other administrations and external organizations, and services to citizens. A total number of 19 managers were interviewed, as well as several key informants.

2.4. Conclusions

This dissertation investigates multiple facets of user adaptation to IT and its connection to IS success. It aims to provide a better understanding this phenomenon and draws attention on the need to enrich our studies in the domain of adoption and acceptance and IT. Table 2-2 provides an overview of the dissertation chapters.

Table 2.2. Dissertation Overview Table

	Chapter 2: Information Quantity and IS Success	**Chapter 3: User strategies of adaptation in the presence of disruptive technologies**	**Chapter 4: Managerial adaptation strategies to IT change in Public Administration**
Purpose	▪ Study of user adaptation to information quantity. ▪ Study of the influence of information quantity on information systems success.	▪ Study of user strategies of adaptation to disruptive enterprise systems. ▪ Study of the influence of espoused cultural values on user adaptive strategies.	▪ Study of managerial responses to IT change in local government agencies
Domain	▪ Interaction with a website system	▪ Implementation of an ERP system ▪ Cross cultural Study	▪ Implementation of Large Integrated Systems ▪ Public administration context
Theoretical Background	▪ Information Systems Success (DeLone and McLean 2003) ▪ Decisional Guidance (Silver 1990, 1991)	▪ Coping Model of User Adaptation (Beaudry and Pinsonneault 2005) ▪ Espoused Cultural Values (Srite and Karahanna 2005)	▪ Temporal Theory of Human Agency (Emirbayer and Mische 1999) ▪ Strategic Actor Theory (Crozier and Friedberg 1977)
Methodology	▪ Quantitative Study ▪ Experimental Design	▪ Quantitative Study ▪ Experimental Design	▪ Qualitative Study ▪ Interpretive Case Design
Sample / Research Material	▪ 131 subjects	▪ 209 subjects	▪ 19 middle-managers and 12 informants ▪ Informal discussions
Common Glue	▪ Shows how system-embedded coping mechanisms are used by system users. ▪ Suggests that system users spontaneously develop coping mechanisms to information overload. ▪ Suggests the existence of a gap between how users perceive and interact with systems, and the overall success of systems.	▪ Suggests that system users adopt generic strategies in order to adapt to disruptive enterprise systems. ▪ Suggests that these adaptive strategies depend on how much control system users have over their work, self, and technology. ▪ Suggests that individual differences, namely cultural values influence how users adapt to systems.	▪ Describes managerial temporal agency around the implementation of a disruptive integrated system. ▪ Analyzes the contribution of public middle managers to the transformation of public administration, how they receive change and how they implement it. ▪ Describes how IT constraints contribute to shaping managerial responses to change and modernization in public administration.

Chapter 3

Information Quantity and IS Success

Abstract

Information overload is a serious problem. How users adapt to systems that present them with increasing amounts of information is an especially difficult challenge. This paper attempts to derive theoretically robust explanations for how the effects of information overload can be mitigated. It also attempts to demonstrate that if these stratagems were to be adopted by users and managers, user productivity would inevitably rise.

Indeed, while there certainly have been IS studies that focus on information quality and its downstream effects, there is little guidance in the literature on the effects of quantity/volume of information on information quality, and on subsequent attitudes and behaviors that are surrogates for the ultimate success of systems. Our goal in this paper was to formulate research that could successfully address these issues.

In order to answer our research questions, a laboratory experiment was conducted with 131 subjects. Contrary to what was posited, we found information quantity had no curvilinear effect on information quality. Instead, we found that the more information individuals have to process and the more they are provided with features to deal with large amounts of information, the better the perceived quality of information. We discuss these findings

focusing on the impacts of information quantity on IS success. We conclude the study with theoretical and practical implications.

Keywords: IS success; information overload; filtering mechanisms; information quality; information quantity; information uncertainty; user satisfaction; system usage.

3.1. Introduction

Information technologies (IT) lead to profound changes in the ways people work. Organizations using IT strategically are said to better compete in the marketplace (Henderson et al. 1999). Similarly, at the individual level, a greater fit between tasks and IT has an impact on better decisions and higher user satisfaction (Goodhue et al. 1995). Thus, to take full advantage of information systems, users need to constantly adapt to system characteristics (Daft et al. 1987; Wetherbe 1991).

These theses are all the more salient as users today must respond to systems bombarding them with increasing amounts of information. Information overload makes it even more difficult to facilitate daily work tasks via IT (Mintzberg 1972). In particular, information overload can be considered to be a problem of the entire organization (Eppler et al. 2004; Schultze et al. 1998) in that it can diminish individual performance (Ackoff 1967; Hiltz et al. 1985) and affect usage behaviors with respect to the system. However, given that the vast majority of studies examining system success have focused on information quality as a key antecedent, there is little guidance in this literature on the effects of quantity/volume of information on user behaviors, or on how information uncertainty enters into this mix of effects. Significant research questions, therefore, are:

(1) What are the effects of information quality on system usage and user satisfaction?

(2) Do increasing amounts of system-provided information and information uncertainty have detrimental effects on information quality?

(3) Can the impact of increasing amounts of information be mitigated by filtering mechanisms?

This study makes three major contributions. First, it develops a model for user adaptation to information overload. Second, it attempts to show how information overload can be mitigated. Third, assuming that many/most of the hypotheses are supported, it will highlight the need for IS managers to specifically take into accounting the influence of the quantity of information provided to system users.

The structure of the paper is as follows. In the first section, we motivate the need for this work, specifically by offering a deeper look at how users do or do not adapt to increases in information load. We present the theory base for this research, the updated DeLone and McLean (2003) IS Success Model (ISM). Next, we develop a model and hypotheses for user responses to increasing amount of information. We follow with the research methodology and contributions to research and practice.

3.2. Theoretical Framework

In the absence of an adjustment between the technology and the individual, there will be unsatisfied user issues, such as information overload or an insufficiency of relevant information provided by the system (Goodhue et al. 1995; O'Reilly 1980; Schultze et al. 1998). These unsatisfactory assessments may have a long term detrimental effect on full and effective use of systems.

How does this situation arise? It has often been argued that organizations that consider IT to be strategic assets should try to enhance the volume and quality of the information flow in order to improve productivity and decision making. Yet the IS literature has not been forthcoming in explaining just how much information is "enough" and what might be "too much." Other than a few studies reporting the need for higher volumes and better quality of information, little is really known about how information volume affects user perceptions of net benefits.

Assuredly, information is the lifeblood of the effective organization. Managers spend most of their time gathering and processing information from various sources such as systems, meetings, or informal conversations (Mintzberg 1972; Wetherbe 1991). Having more information available helps to perform work tasks more efficiently and to reduce uncertainty and ambiguity (Daft et al. 1986; Daft et al. 1987). Yet this bounty can be too munificent. IT provides potentially powerful responses to organizational concerns, but at the same time dramatically increases the volume of information to be processed.

System characteristics can have a substantive influence on information overload. Because information overload has negative effects on the work of users, several researchers recognize the necessity to adapt the IS to user tasks (Chung et al. 2005; Goodhue et al. 1995; Grisé et al. 2000; Speier et al. 1999), needs (Ackoff 1967; Mintzberg 1972), or cognitive style (Miller 1972; Robey et al. 1981; Taggart et al. 1981). Structured and semi-structured tasks can be more easily taken into account in a system than unstructured tasks because the latter is dependent on the subjectivity of those who perform them, people such as managers (Mintzberg 1972; Robey et al. 1981; Taggart et al. 1981). Some studies show that a too large volume of information provided by the system can diminish its profitability (Ackoff 1967; Eppler et al. 2004). Moreover, there are individual factors such as task type to be considered

in order to understand how information overload affects system benefits (Grisé et al. 2000; Speier et al. 1999).

One model that discusses the relationship between characteristics of information and ultimate success is DeLone and McLean's ISM. DeLone and McLean first articulated their IS success model in 1992 and made further refinements in 2003. The ISM is, thus, an evolving framework for understanding the underlying predictors of IS success. In particular, information quality is positioned as a critical independent variable. In DeLone and McLean's conceptualization (1992), information quality refers to the attributes of information needed by the users. Content, accuracy, and format are the attributes referred to and studied most frequently (Rai et al. 2002).

However, while information quality is taken into account in the ISM, there is little-to-no guidance on the role of quantity or volume of system-provided information in the ultimate success of systems. Since information overload has been so lightly studied in the IS literature, much remains to be discovered about its key causes, effects, and potential countermeasures (Eppler et al. 2004). Information systems may be the cause of information overload as well as offering the very tools that will permit us to cope with the phenomenon. Therefore, because ISM to date has focused exclusively on information quality measures, we believe that it should be augmented with information quantity. Moreover, given the important potential effects of information on tasks, processing, and decision making of systems users, we believe that further refinements of the information quality construct may be needed to fully appreciate the role of information in IS success.

Information uncertainty, we argue, can also impact information quality. Building on DeLone and McLean's work, the purpose of this study is to determine other information-related constructs that determine IS success.

3.3. Model

The conceptual model for this research is presented in Figure 3-1. As stated above, it builds on more established elements of ISM, and therefore we first present hypotheses related to the standard linkages between system quality, information quality, intention-to-use, and user satisfaction.

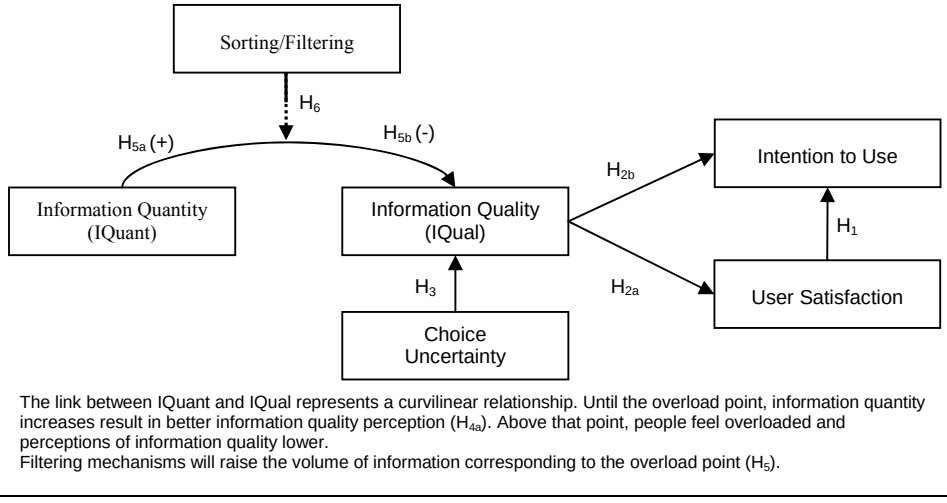


Figure 3-1. Research Model

3.3.1. Outcome Variables in ISM: Intention to Use

In accord with the thinking behind the updated ISM, systems and service characteristics as well as information quality are posited as predictors of intention-to-use. An important underlying concept here is that intention-to-use is a dependable surrogate of usage behaviors. Indeed, according to researchers, an intention can in many cases substitute for use, given the measurement concerns inherent in the usage construct (Burton-Jones et al. 2006; DeLone et al. 2003). In sum, intention-to-use can be employed as an indicator of IS success.

DeLone and McLean (2003) link intention-to-use to quality determinants, namely system quality, information quality, and quality of service. Together, these parameters encompass a

wider set of determinants, since the goal of ISM is to be a global model for understanding IS success. Figure 1 is a parsimonious model showing only information quality as a direct antecedent. In contrast, the technology acceptance model or TAM (Davis 1989) links intention-to-use downstream from perceptions of ease of use and usefulness. TAM is an adaptation of the theory of reasoned action or TRA (Fishbein et al. 1975) to the domain of technology acceptance in which the predictor, attitude toward using, is replaced by ease of use and usefulness of a specific IT (Bagozzi et al. 1992b). As a result of the long history of TAM studies, intention-to-use is now a mature construct which has received a considerable audience within the IS community. Also important to note is that alternative conceptualizations, not yet fully tested in IS, challenge the conceptualization of the construct of usage, and subsequently of intention-to-use (Burton-Jones et al. 2006).

3.3.2. Information Satisfaction

User information satisfaction is another important dependent variable in ISM. This outcome variable is also particularly appropriate for studies investigating matters such as the effects of information overload on how individuals perceive IS or interact with IS (Speier et al. 1999; Ting-Peng et al. 2006). This concept has been the focus of a considerable number of studies in IS and has often been presented as a measure of IS success. For example, Ives et al. (1983) state that: “User Information Satisfaction (UIS) can be more than a substitute for an objective measure of system success. UIS measures how users view their information system rather than the technical quality of the system. A ’good‘ information system perceived by its users as a ’poor‘ system is a poor system” (Ives et al. 1983, p. 786). In fact, user satisfaction is an especially appropriate measure of system success when system use is voluntary (Robey 1979).

Researchers often utilize subjective measures of system usage as measures of system success. In fact, some of them argue that system usage is difficult to measure accurately with objective measures (Ives et al. 1983), while objective and subjective measures of usage might measure different things (Straub et al. 1995). User satisfaction, which is a subjective measure of system success, appears to be a very appropriate measure of system success, and, in some respects, it is a better surrogate than usage (DeLone et al. 1992; Ives et al. 1983; Robey 1979). For example, DeLone and McLean (1992) argue that it is a key aspect of IS success because of its face validity, its measurement validity, and the conceptual and empirical strength of the concept itself (DeLone et al. 1992). In the updated ISM, user satisfaction is determined by system characteristics and these, in turn, determine intention-to-use.

An important historical debate has focused on measuring user satisfaction (e.g., Baroudi et al. 1988; Doll et al. 1988; Doll et al. 1991; Doll et al. 2004; Galleta et al. 1989; Ives et al. 1983). Doll and Torkzadeh (1988) developed a competing instrument to Ives et al. (1983) for measuring user satisfaction. They defined end-user computing satisfaction as "the affective attitude towards a specific computer application by someone who interacts with the application directly" (Doll et al. 1988, p. 261). Based on a thorough review of the relevant literature on the topic, they developed a 12 item scale for measuring end-user satisfaction. In this they identified five indirect aspects of the concept: content, accuracy, format, ease of use, and timeliness with respect to the system and the information provided by the system. They suggest that these components of user satisfaction might be affected by different functions of the system, for example its design, or the way it is operated (Doll et al. 1988).

Additionally, Wixom and Todd (2005) developed and validated a model of the influence of information satisfaction on intentions mediated by usefulness. Lee et al. (1995) showed that end user satisfaction with IS was related to IS acceptance and overall job satisfaction.

Therefore we posit that user satisfaction influences intention-to-use as in the following hypothesis:

HYPOTHESIS 1: *Information satisfaction will positively influence intention-to-use.*

3.3.3. Information Quality

Generally speaking, information quality is a relatively poorly defined construct in IS and there is a need for a better theorization (Nelson et al. 2005). Rather, attention has been lavished on user perceptions, a situation which has led to under-theorizing of information quality (Nelson et al. 2005). In testing DeLone and McLean's ISM (2003), researchers generally assume that users can process the information quantity they are presented and information quality is analyzed without further qualification. As noted above, the original key dimensions of information quality were defined by such attributes as accuracy, timeliness, completeness, relevance, and consistency (DeLone et al. 1992; DeLone et al. 2003). In the updated version of the model, information quality attributes include completeness, ease of understanding, personalization, relevance, and security (DeLone et al. 2003). Neither sets of attributes explicitly hold information quantity constant or posit what happens if it varies. Information quantity, therefore, is generally considered to be a fully embedded attribute of information quality. That is, the system has to provide sufficient information to users so as to help them in decision making tasks. Nelson et al. (2005) identified two views of information quality. An extrinsic view of information quality considers information as an object and this view defines quality regardless of the context to which it refers. The context-based approach, on the other hand, suggests that information quality needs to be defined with specific regard to users, tasks, and applications (Nelson et al. 2005). Nelson et al. (2005) go on to capture the key elements of information quality by reducing thirty dimensions from the literature to four dimensions: accuracy, completeness, currency and format. Currency represents the degree to

which information is consistent with "the current state of the world that it represents" (p. 204), and format "the degree to which information is presented in a manner that is understandable and interpretable to the users and thus aids to the completion of tasks" (p. 204). Each dimension of information quality fits one-to-one into the categories of: "intrinsic" (information accuracy), "extrinsic contextual" (completeness and currency), and "extrinsic representational" (format). Overall, Nelson et al. (2005) set forth information accuracy as the key determinant of information quality in the data warehousing context.

DeLone and McLean (1992; 2003) present substantial evidence that there are significant direct relationships between information quality and intention-to-use the system and user satisfaction. This assertion was later confirmed by Rai et al. (Rai et al. 2002). Moreover, Ting-Peng et al.(2006) showed that recommendations by the system and accuracy of the recommendations significantly correlate with higher levels of user satisfaction. This suggests that better information quality is related to higher user satisfaction. Other researchers have shown that information quality is likely to make individuals have more favorable attitudes towards systems that provide high quality information (Eppler et al. 2004; Ting-Peng et al. 2006). Users are indeed likely to be more satisfied with the system and information it provides (Ting-Peng et al. 2006). Indeed, Wixom and Todd (2005) found a strong relationship (β=.43, $p<0.001$) between information quality and information satisfaction. Also, the literature generally supports the assertion that users are also more likely to show a higher level of intention-to-use the system since the information provided is relevant for their work and consistent with their tasks. This leads us to hypothesize that:

HYPOTHESIS 2a: *Information quality will be positively related to intention-to-use.*

HYPOTHESIS 2b: *Information quality will be positively related to user satisfaction.*

3.3.4. Choice Uncertainty

It is widely acknowledged that individuals make decisions under conditions of bounded rationality (Crozier et al. 1977; Simon 1957). Bounded rationality can be seen as individuals' limited information processing capacity (Lipman 1995). This induces individuals to make choices that might not be optimal. Lipman (1995) discusses models of information processing whereby the agent observes then processes information, which determines his vision of the problem she has to deal with. Then, this determines his behavior (Lipman 1995). The fact is that individuals rarely have all the information needed to make decisions, and are thus often faced with uncertainty (Crozier et al. 1977).

Our next argument is that with higher levels of perceived uncertainty, individuals might perceive lower levels of information quality. There are many definitions of uncertainty in the literature. Tushman and Nadler (1978) describe uncertainty as "the difference between information possessed and information required to complete a task" (Tushman et al. 1978, p. 615), a definition that is consistent with Galbraith (1974). Based on this researcher, Egelhoff (1991) states that "effective organizations are those that can fit their information processing capacities (for gathering, transforming, storing and communicating information) the amount of uncertainty they face" (p. 343). Urbany et al. (1989) studied how uncertainty was related to the search that takes place before an individual makes a purchase. A principal factor analysis permitted them to identify two related kinds of uncertainty. The first is knowledge uncertainty, that is, uncertainty with respect to information about alternatives; the second is choice uncertainty, uncertainty with respect to information about which alternative to choose. They argue that both kind of uncertainty need to be reduced for more effective information searching. It is the last point – choice uncertainty - that holds the greatest for the present study, but the first form of uncertainty might also be included in an overall construct of

information quality. Among potential problems linked to higher uncertainty, Evaristo (1993) found higher mental workload, which can lower subjective performance. In addition, when system users are not confident in decision making tasks with the information provided, information quality attributes (DeLone et al. 2003; Nelson et al. 2005) are likely to be negatively impacted. In any case, when a decision maker is undecided, s/he is likely to perceive information to be of poorer quality. Researchers, in fact, generally link uncertainty to lower levels of information quality (Gifford et al. 1979). Therefore,

HYPOTHESIS 3. Choice u*ncertainty will be negatively related to perceived information quality.*

3.3.5. Information Quantity

Research suggests that information quantity and information quality are related (Keller et al. 1987). We suggest that when information quantity increases, it contributes to information quality up to a certain point. Once that point is reached, any additional information results in information overload and decreases information quality perception. Researchers manipulated information quantity in different ways. Manipulating the number of alternatives and / or of attributes is recognized as an efficient ways to manipulate this parameter in lab experiment, as shown in Table 3-1 below.

Table 3.1. Selected Studies on Information Overload

Study	Conceptualization of Information Load	Task	Operationalization of Information Load	Key finding
Hahn et al. (1992)	Number of attributes per alternative	Choosing a College to study or a company to work	• Nb. alternatives: 10 • Nb. attributes: 3, 6, 12, or 20 attributes presented/alternative • Time pressure: 2 seconds of information acquisition/attribute + 20 seconds for making a decision	• Found an inverted U-shaped relationship between information load and decision quality under time pressure, but not without time pressure.

Keller and Staelin (1987)	Number of attributes per alternative	Choosing a job among 5 jobs alternatives	• Nb. attributes: 4, 8, 10, or 12 attributes • Nb. alternatives: 5 alternatives • Time allowed: 45 minutes	• Identifies Information Quantity and Information Quality as two relevant dimensions of Information. Information quantity and Information Quality have opposite effects on decision effectiveness. • Too much information and too much information of high quality might dampen decision effectiveness. • They found a U-Shaped relationship between information quantity and decision effectiveness.
Lurie (2004)	Number of alternatives and distribution of attributes across alternatives	Study 1: Buying a calculator at an online retailer	• Information structure: 18 or 27 alternatives x even or uneven distribution of attributes across alternatives • Uneven conditions : 7/9 = 1 level, 1/9 = 2 levels, 1/9 = 3 levels • Time allowed: 2 minutes	• Taking the information structure into account helps better predict information overload.
		Study 2: Same as Study 1, but using an information acquisition system	• Nb. Alternatives = 16 alternatives • Nb. Attributes = 8 for 24 sets of calculators Manipulation of information structure: (Nb. Attributes levels and distribution of attributes levels across alternatives) • Time allowed : 60 seconds	• Less information is acquired in choice sets that have more information. The authors note a resulting decrease in decision quality effectiveness. • High levels of information induce consumers to be more selective in acquiring information.
Malhotra (1982)	Number of alternatives and of attributes	Choice of a house to buy	• Nb. Alternatives = 5, 10, 15, 20, 25 • Nb. Attributes = 5, 10, 15, 20, 25 • No time constraints	• Information overload appears and remains relatively constant from 10 to 25 alternatives and from 15 to 25 attributes.

Another consideration when studying the effects of information quantity on information quality is user information processing capacity versus information processing requirements. Tushman and Nadler (1978) argue that organizational effectiveness will be achieved when information processing capacity is consistent with information processing requirements. Similarly, the literature suggests that individuals faced with insufficient information processing capacity with respect to their information processing requirements are likely to make poor decisions (Eppler et al. 2004). In fact, Shannon and Weaver (1949) first developed the term "information processing" in communication theory (Ungson et al. 1981) where it is posited that individuals develop information processing strategies when performing

information-related tasks. Information processing strategies refer to the processes of selecting, combining, weighting, and altering information (Ungson et al. 1981).

Clearly, having exhaustive and useful information at hand is often considered to be a good thing. For example, a key attribute of information quality is "completeness" in DeLone and McLean's (1992; 2003) definitional attributes of information. This point of view notwithstanding, users can miss relevant information in the sheer volume of information presented, even if it is complete, and this can clearly be detrimental to decision making. Therefore, information overload is universally viewed as a problem (Ackoff 1967; Chung et al. 2005; Schultze et al. 1998).

However, researchers do not always provide clear-cut results in the course of the identification of information overload. For example, in a re-analyses of several studies, et al. (1982) show that while several authors claim to detect overload, in fact they fail to detect an effect. More importantly, they suggest that an interaction between the number of alternatives and the number of brand-attributes on which information is provided (p. 34) is likely to exist, making it necessary to analyze both aspects when studying information overload (Malhotra 1982).

Numerous drivers of information overload in various contexts have been highlighted in the literature (Eppler et al. 2004). Consistent with prior studies, Ting-Peng et al.(2006) assert that a too large volume of information and low information accuracy will induce information overload. Among the drivers of information overload, several authors mention poorly designed systems, those not attuned to individual needs (Robey et al. 1981; Taggart et al. 1981) or those outputting too much irrelevant or useless information (Ackoff 1967; Sproull 1985; Wetherbe 1991). Corroborating this, Kalika et al. (2007) found that media in most organizations are simply aggregated, but not mindfully organized. In fact, Isaac et al. (2006a)

showed that the more IT are made available to workers, the more those workers are likely to experience information overload.

Several authors offer evidence that up to a certain point, increases in information load are, ironically, related to increasing decision accuracy (Eppler et al. 2004; Evaristo 1993). These researchers go on to make the argument that there is a point at which all additional information provided by the system results in information overload and, from that time onward, information accuracy decreases (Eppler et al. 2004; Schultze et al. 1998).[1] Several authors found evidence of this inverted U shaped relationship between information load increase and decision quality (Evaristo 1993; Hahn et al. 1992; Keller et al. 1987). While Keller and Staelin (1987) did find an inverted U shaped curve between information quantity and decision effectiveness, they also found that this effect occurred with information quality at a fixed level. Others, while they do link information load increase to information overload, discovered only a decrease in decision quality (Lurie 2004; Malhotra 1982). Overall, although individuals are able to process important volumes of information, they are still limited in their processing capacities (Malhotra et al. 1982).

In this study, we define information quantity as the volume of information provided to users in system output. Within the large body of research in the information load paradigm, information load is conceptualized in terms of the number of alternatives and the number of attributes to consider during decision making (Jacoby et al. 1974; Lee et al. 2004; Malhotra et al. 1982). By contrast, Lurie (2004) highlights limitations of that approach and suggests that the number of alternatives and attributes are only determinants of the overall amount of

[1] Other researchers show that such an effect does occur, but only when decision makers are faced with time pressure, and that without this constraint, decision accuracy keeps increasing when more information is provided to individuals Hahn, M., Lawson, R., and Lee, Y.G. "The Effects of Time Pressure and Information Load on Decision Quality," *Psychology & Marketing* (9:5) 1992, pp 365-378..

information. This researcher suggests that it is important to capture multiple dimensions of information, especially in online environments that are often likely to overload consumers. Lurie (2004) thus suggests a structural approach to information, taking into account the number of attributes levels and how those levels are distributed across alternatives (p. 484):

> A structural approach to information suggests that there are multiple dimensions determining the amount of information (potential outcomes) that consumers need to process when making choices among a given set of product alternatives. These include the number of alternatives, the number of attributes, the number of different attribute levels associated with each attributes, and the distributions of attribute levels across alternatives. As a measure of the amount of information in a choice set, information structure should provide an indication of the amount of information processing necessary to make a decision (p. 474).

Finally, in his study, Lurie (2004) suggests that more alternatives do not necessarily mean more information and that it does not necessarily imply information overload.

In sum, more information seems to be better up to a certain point. Having too much information, however, no longer leads to task completion, a key attribute of information (Nelson et al. 2005). Naming the point from which any additional information results in information overload as the "overload point", we posit a gradually increasing positive effect before the overload point and a gradually decreasing one after that point. We therefore hypothesize that:

> HYPOTHESIS 5: *Information quantity will display a curvilinear relationship with information quality.*

3.3.6. Mechanisms for Coping with Information Overload

Information overload is said to have detrimental effects on information quality and on decision quality. It is important to identify how to improve system users coping with this phenomenon. Eppler and Mengis (Eppler et al. 2004) identified several "personal factors", "information characteristics" and "tasks and processes parameters" (p. 335) in the literature

that can help to prevent or reduce information overload. Indeed, having to process too much information, users can miss important information and may not use the system effectively and efficiently (Ackoff 1967). This raises a fundamental question: How do users adapt to various amount of information? The literature provides several indications for answering this question. Specifically, it suggests that individuals can: 1) make use of system-embedded filtering capabilities and 2) spontaneously develop coping heuristics when confronted with systems displaying large amounts of information.

Ackoff (Ackoff 1967) predicted that the rise of systems would be accompanied by an increasing volume of text-based information, resulting in information overload, and this prediction proved to be amazingly accurate. Under such circumstances, researchers (Ackoff 1967; Miller 1972; Mostafa et al. 1997) hypothesize that the importance of filtering would rise in that it will allow users to essentially reduce the amount of information provided by electronic media. Information filtering systems are thus thought to be one of the most efficient way for dealing with information overload (Ackoff 1967; Loeb et al. 1992; Morris et al. 1992; Mostafa et al. 1997; Pennington et al. 2007).

Users can be provided with system-embedded filters. According to Ackoff (1967), dealing with the problem of systems supplying an overabundance of irrelevant information incites users to adopt information filtration and condensation strategies. Consequently, setting appropriate filters in IS can be beneficial in dealing with the information overload problem. As recognized by Loeb and Terry (1992):

> The success of many new information services that provide end users with access to diverse information sources is crucially dependent on the availability of effective filtering technology (p. 28).

What kinds of filters are believed to impact information overload? According to Mostafa et al. (1997), “the primary objective of an Information Filtering System is to perform a mapping

from a space of documents to a space of user relevance values" (p. 370). For these researchers, filtering consists in "ranking and presenting incoming documents according to a particular user's interests" (p. 397). Filtering mechanisms, though, depend on both the type of information, and the architecture for transporting information (Loeb et al. 1992). In their study, Morris et al. (1992) describe the development of a text condensation tool for filtering text-based information. They demonstrated that condensed information could be largely sufficient for decision makers as compared with full text information. Their experiment showed that subjects given condensed information had similar comprehension to those who had full text information. Moreover, extraction algorithms can provide condensed texts that are as informative as full length texts (Morris et al. 1992), therefore confirming Ackoff's (1967) prior assertions. Other researchers have tended to question this view. For example, it has been found that condensed information is related to better decision quality, but, in the same time, to lower user confidence in the decision made and longer decision times (Chervany et al. 1974).

Filters such as recommendation agents have been of intense interest in IS research (Ansari et al. 2000; Bo et al. 2007; Huang et al. 2004; Ting-Peng et al. 2006; Wang et al. 2005). Recommendation agents (RA) are "software agents that elicit the interests or preferences of individual users for products, either explicitly or implicitly, and make recommendations accordingly" (Bo et al. 2007, p. 137). Indeed, numerous researchers (e.g. Bo et al. 2007) mentioned recommendation agents (RA) as tools that can help users cope better with information overload. RA act as filters and facilitate decision making (Ansari et al. 2000; Bo et al. 2007; Ting-Peng et al. 2006).

Researchers identify three types of RA, depending on how they filter information. RA can filter based on content (content filtering), on the opinion of other persons with a similar mind

as the decision maker, or on both content filtering and collaborative filtering (Ansari et al. 2000; Bo et al. 2007). Such systems can thus be considered to be filtering systems when they offer personalized information output based on information collected from users (Mostafa et al. 1997).

Additionally, the literature suggests that in order to cope with information overload or to avoid this phenomenon, users also spontaneously develop coping mechanisms (Ackoff 1967; Hiltz et al. 1985; Schultze et al. 1998). These coping mechanisms consist mainly in filtering, for example selecting information from only certain sources, filtering information based on criteria, or by labeling information based on its importance or significance. For that, in addition to their use of system-embedded filters, system users are likely to develop sorting and filtering mechanisms *in media res*, and for these reasons, information overload can, in many cases, be mitigated.

Interestingly, Schultze and Vandenbosh (1998) suggest an increase in information load is not directly related to information overload. Instead, they found that the relation between the increase of information load and information overload is mediated by the control that users have over information. They also argue that IT features and capabilities can help users deal with greater amounts of information, which makes information overload less likely to occur.

Similarly, Lurie (2004) suggests that people overloaded with information face time pressures. In order to adapt to this state, people consequently tend to be more selective in acquiring and processing information. Information processing increases are, thus, a mediator of the relation between information structure and information overload (Lurie 2004). However, Lurie (2004) suggests that this leads people, who are unable to process all information, to be less likely to choose the best solution when making decisions.

Using a different methodological approach but coming to similar conclusions, Malhotra (1982) shows that when individuals are overloaded, the detrimental effects of information load are constant even in the case of an increase of information. One explanation advanced by Malhotra (1982) for this phenomenon is that people cope with overload with spontaneous problem solving heuristical processes. Indeed, instead of trying to analyze all information at hand in detail, IT users adopt simplifying strategies, thus making superficial analyses and omitting details when analyzing attributes.

For all these reasons, we posit that coping mechanisms can mitigate the effects of information overload. When users are provided with means for effectively coping with information load increase – such as system embedded sorting and filtering capabilities - we posit that the effects of information overload will appear later than when none are provided. We posit, thus, a moderation. According to Carte and Russel (Carte et al. 2003, p. 3), Z is a moderator if "the nature of the X →Y relationship varies as a function of Z". Following the discussion above, we hypothesize the effect of coping mechanisms as a moderation effect.

HYPOTHESIS 6: *Filtering and sorting capabilities will raise the overload point on the curvilinear relationship between information quantity and information quality.*

In the following section, we present the methods planned for the study.

3.4. Methods

In order to address the research questions in this study, we employed a 3 (3 levels of information quantity) x 2 (2 levels of filtering capabilities) experimental design instrumented through a web-based experiment. Since the design random assigned subjects to treatments, it

is said to be a true experiment. True experimental designs are often described as the most rigorous possible experiments (Trochim 2000).

3.4.1. Experimental Task

Various approaches to information overload have been utilized in past research. Important concerns arose however in the measurement of information overload. Malhotra et al. (1982) suggest that "in the information overload paradigm, the occurrence of information overload is determined by examining the ability of consumers to make correct choices across different treatment conditions" (p. 30). In their experimental setting, Malhotra et al. (1982) basically tested individual decision making performance under different conditions, each condition being characterized by a different information load (Malhotra et al. 1982).

Our experimental task was adapted from procedures of Lee and Lee (2004) and Evaristo (1993). For the task, we manipulated two factors: information quantity (3 levels) and the presence (or not) of a mechanism for filtering and sorting information effectively (2 levels). Participants were asked to imagine that they have to buy an MP3 player for a friend at an online retailer and to make a choice about which MP3 player to buy. Their friend's preference rankings are provided in a table with the description of each of the features (4, 8, or 12 features). They have been given information in a matrix format about a series of MP3 players with invented model names. Each MP3 player was assumed to be in the same price range. Only when they were provided with sorting and filtering capabilities, subjects could sort each MP3 players ascending or descending depending on attributes levels. They could also choose to display the only MP3 players that corresponded to desired attribute levels. Sorting and filtering mechanisms thus helped subjects organize and select information according to their needs. After they choose an MP3 player, they reported the model they chose. The experiment

was a repeated measure, within group design with each subject receiving two treatments at different information quantity levels.

In contrast of other researchers who performed their experiment under time pressure (Evaristo 1993), we let subjects decide the amount of time they would allocate to the task. This gave the experiment a "critical realism" that is important in experiments (Fromkin et al. 1976). Evaristo (1993), for example, manipulated time pressure varying the amount of time allowed for completing the task. Lee and Lee (2004) introduced a unique, limited amount of time for all participants and manipulated only the amount of information to be taken into consideration. Hahn et al. (1992) found introducing a limited amount of time to affect the inverted U-curve function describing the relationship between decision quality and information load. The researchers suggest that time pressure is a necessary condition for the information overload problem to occur at high levels of information load, dampening decision quality. Thus they believe that it was important to maintain time pressure as an experimental control.

Malhotra (1982), however, argues that time pressures bias information processing and decision making. Further it is not sufficiently realistic in online buying situations, since, in fact, consumers do not face such time pressures. Consistent with Malhotra (1982) and in contrast to previous studies (Evaristo 1993; Hahn et al. 1992; Lee et al. 2004; Lurie 2004), subjects were thus not constrained by time pressure for performing the task even though we did measure how much time subjects spent on performing the task and included this parameter in the model as a control variable. A Web-based chronometer recorded time from the beginning of the task in the information acquisition phase, to the end of the task, when the subject made a choice about which MP3 player to buy.

Information quantity, or load, has been operationalized in consumer research as the number of attributes per alternative (Hahn et al. 1992), or as both the number of attributes and alternatives (Lee et al. 2004). Lurie (2004) questions the idea that more alternatives is systematically associated with more information. Accordingly, in the present study, information quantity was operationalized as only the number of attributes (number of MP3 players features).

In addition to these two information characteristics, Lurie (2004) suggests that information structure has significant effects on the way information is acquired and subsequently on information overload. In fact the author points out that providing more alternatives does not necessarily means providing more information. There are two important information structural parameters to take into account. As Lurie (2004) puts it: "the number of different attribute levels associated with each attribute […] and the distribution of attribute levels across alternatives" (Lurie 2004, p. 474). Lurie suggests that a uniform distribution of attributes levels in alternatives is more likely to induce information overload than a non-uniform distribution. Accordingly, in order to make information overload more salient at higher levels, information structure was set so that attribute levels were uniformly distributed across MP3 players.

Next, information quantity was set as either low (L = 4 features), medium (M = 8 features), or high (H = 12 features) in the treatments.

Filtering mechanisms were also manipulated. Either subjects were provided with embedded sorting and filtering capabilities helping them to effectively identifying the best solution (Y), or they were not (N). The sorting capability allowed subjects to sort MP3 players by features ascending or descending. The filtering capability allowed subjects to select several feature levels, which allowed them to decrease the number of alternatives displayed on the website.

For a given quantity of information, the table displays were identical. Details of the resulting six conditions are shown in Table 3-2 below.

Table 3.2. Experimental Manipulation – Six Conditions

Manipulation	1	2	3	4	5	6
Information Quantity	L	L	M	M	H	H
Filter	Y	N	Y	N	Y	N

Legend: L=Low; M=Medium; H=High; Y=Yes; N=No

After completing the task, subjects were asked to select the MP3 player they would choose for their friend on a drop-down list. Manipulation checks were introduced for information quantity and sorting / filtering capabilities in order to ensure that subjects have received the expected treatment.

3.4.2. Measurement of Constructs

Information quality. In their empirical test of the IS success model, Rai et al. (2002) assessed information quality through three dimensions, content, accuracy, and format, which are widely used measures of information quality in the user satisfaction literature. Information quality is defined as "the degree to which information produced has the attributes of content, accuracy, and format required by the user" (Rai et al. 2002, p. 57). Due to high pairwise correlations among the three constructs in the original instrument of Doll and Torkzadeh (Doll et al. 1988), they modeled it as a single reflective construct. However, since content, accuracy and format are posited as facets of information quality, it would probably be more appropriate to model it as a formative construct (Petter et al. 2007). In their study, Wixom and Todd (2005) obtained appropriate results by positing these construct as antecedents of a global information quality reflective construct. Doing so, they also avoided the construct misspecification errors issue (Petter et al. 2007). For these reasons, in contrast to Rai et al. (2002), we decided to model content, accuracy and format as distinct reflective constructs, antecedent of a global information quality construct.

Information satisfaction is operationalized as a parsimonious, two item variable in accordance with Wixom and Todd (2005). Prior research such as Rai et al. (2002) used a single item for this construct. Whereas, according to Baroudi and Orlikowski (Baroudi et al. 1988), a parsimonious single item measure can appropriately measure user information satisfaction, researchers usually consider multiple item scales to be more statistically rigorous than single item ones (Cook et al. 1979). This justifies our choice of the scale of Wixom and Todd (2005).

Intention-to-use was measured using the behavioral intention items in Venkatesh et al. (2003). It is a common scale often used in TAM based articles. A summary of construct definitions is provided in Table 3-3 below, while details about the questionnaire instrument are given in Appendix.

Table 3.3. Definition of Constructs and Items

Construct	Definition	# Items	Item Source
Information Satisfaction	"The degree of user satisfaction with the system" (Rai et al. 2003, p. 57)	2,00	Wixom and Todd (2005)
Information Quality	"Perception of the quality of information included in the system" (Wixom and Todd, p. 91)	4,00	Wixom and Todd (2005)
Content	"the degree to which the system provides all necessary information" (Wixom and Todd, p. 91)	4,00	Rai et al. (2002)
Accuracy	"The user perception that the information is correct" (Wixom and Todd, p. 91)	2,00	
Format	the users' perception of how well the information is presented" (Wixom and Todd, p. 91)	2,00	
Choice uncertainty	The degree to which the user believes he has or not information about which alternative to choose (Urbany 1989).	2,00	Developed for the study
Intention-to-Use		3,00	Venkatesh et al. (2003)

3.4.3. Manipulation Checks

The questionnaire also included manipulation checks for information quantity and the sorting / filtering capabilities of the website. For information quantity, there were two items, one of which is "how much information do you think was displayed on this website?". The metrics ranged from 1 (very little) to 7 (a great deal). Since filtering / sorting capabilities provide

means to tailor information according to user needs, we checked the related manipulations with items for measuring websites capabilities of providing tailored information from the website quality measurement instrument of Loiacono et al. (2007). The metrics were 7 point Likert scales. The experiment was conducted with graduate and undergraduate student subjects. We review sampling next.

3.4.4. Sample Size Calculations

Sample sizes were determined by considering the power needed to validate measures in the questionnaire (Baroudi et al. 1989). The significance criterion associated with the probability of committing Type I error is α. The coefficient β represents the probability of committing Type II error of not detecting relationships that actually do exist. Consistent with the generally accepted convention (Baroudi et al. 1989), we adopted an alpha protection level of $\alpha=0.05$ and $\beta=0.20$. Power is equal to 1- β or 0.80 and this is sufficient avoid false negatives.

Six groups in total participated in the study. Cell size was set at 20. Therefore, we targeted a minimum number of 6x20=120 observations with 60 participants who were hence required for this study. In total, of the 224 subjects invited to participate, 131 subjects participated (58%), which resulted in 262 observations in the repeated treatments design. The analyses of the dataset were performed with ANOVAs and regression analyses with SPSS 12.

The demographic characteristics of the sample are as follows. In all, 46% of the subjects were male and 54 % female. They used computers 27 hours a week on average. About 60% were less than 23 years old and the other 40 % were older. More than 42% of the students spent 5 years or longer in college (mean of 4.16 years) and more than 60 % had professional experience (mean = 4.59 years, Standard deviation = 6.5 years). Of the subjects, 81 % owned an MP3 player and 68 % have yet performed online purchases. Subjects were familiar to the use of spreadsheets (80%) and of using websites (93%). In terms of being proficient in using

IT, 78 % felt they were. These characteristics make our pool of subjects a population similar to those who had already made online purchases of MP3 players. Further, the experimental task of buying an MP3 player for a friend is realistic and comprehensible to the subjects, since a vast majority of our subjects already owned an MP3 player. In the section following are the validity and reliability checks for our instrument.

3.5. Validity and Reliability

3.5.1. Constructs Validity and Reliability

Convergent and discriminant validity were tested using a principal component analysis with a Varimax rotation (PCA). As shown in Table 3-4 below, the Kayser Meyer Olkin (KMO) measure of sampling adequacy was very good at .91.

Table 3.4. Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.79	59.96	59.96	10.79	59.96	59.96	3.87	21.50	21.50
2	1.85	10.25	70.21	1.85	10.25	70.21	2.91	16.15	37.65
3	1.29	7.19	77.39	1.29	7.19	77.39	2.73	15.18	52.83
4	0.84	4.65	82.04	.84	4.65	82.04	2.05	11.40	64.23
5	0.69	3.82	85.87	.69	3.82	85.87	1.96	10.86	75.10
6	0.57	3.17	89.04	.57	3.17	89.04	1.93	10.70	85.79
7	0.38	2.12	91.15	.38	2.12	91.15	0.97	5.36	91.15

% Var = % of Variance; Cum %= Cumulative %

KMO and Bartletts'test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .91

Bartlett's Test of Sphericity: Approx. Chi-Square = 5192.69; df = 153. p<.000

We specified that 7 factors were to be extracted. The total variance explained by the 7 constructs in the PCA is of 91%, which meets the standard thresholds (Hair et al. 1995). The rotated component matrix is shown in Table 3-5 below.

Table 3.5. Principal Component Analysis

Item	1	2	3	4	5	6	7	Cronbach's Alphas
INTENT3	**.889**	.124	.243	.088	.113	.160	-.014	.95
INTENT4	**.850**	.115	.261	.131	.132	.187	.064	
INTENT1	**.831**	.236	.149	.120	.210	.216	.157	
INTENT2	**.827**	.209	.163	.146	.197	.217	.200	
CON2	.154	**.807**	.277	.233	.250	.120	.144	.92
CON3	.246	**.792**	.187	.257	.174	.184	.113	
CON1	.187	**.788**	.199	.291	.179	.148	.107	
QUAL2	.288	.241	**.792**	.119	.246	.261	.165	.95
QUAL1	.322	.320	**.750**	.158	.277	.150	.094	
QUAL3	.330	.229	**.736**	.173	.231	.310	.171	
UN1	.168	.241	.130	**.884**	.107	.081	.071	.90
UN2	.114	.280	.120	**.881**	.018	.097	.095	
ACC1	.224	.260	.317	.080	**.836**	.153	.094	.94
ACC2	.319	.301	.264	.077	**.768**	.221	.176	
FOR2	.325	.201	.222	.165	.128	**.816**	.131	.91
FOR1	.330	.175	.289	.059	.219	**.795**	.092	
SAT2	.308	.381	.405	.221	.295	.242	**.598**	.96
SAT1	.253	.395	.419	.259	.274	.261	**.591**	

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Rotation converged in 6 iterations.

Convergent validity can be asserted when items of a construct load significantly on their intended construct (Straub et al. 2004). The Varimax rotation shows that items load cleanly on their intended construct. Discriminant validity is assessed when items of a given construct load more highly on their construct than any other construct (Straub et al. 2004). Our results are also evidence that discriminant validity is also achieved.

The measures in this study were taken from prior studies. Thus, we expected good reliabilities. Reliability was assessed through Cronbach's alphas. Cronbach's alphas were all equal to or above .90, which is consistent with our expectations. We thus demonstrated that our instrument was reliable and valid. Next is the analysis of manipulation validity.

3.5.2. Manipulation Validity

Manipulation validity is not always reported in IS research (Boudreau et al. 2001), but manipulation validity is a very important element to test in experimental research (Straub et

al. 2004) and should thus be included in the designs of such research. The purpose of manipulation validity is to ensure that the manipulation in the experiment has been perceived by the subjects (Bagozzi 1977; Perdue et al. 1986; Straub et al. 2004). Descriptive statistics shown in Table 3-6 below suggest that subjects did recognize the manipulation of information quantity. In fact, all three levels of information were considered overloading (means from 4.41 to 5.54) but at significantly different values.

Table 3.6. Mean of Manipulations

Manipulation	Level	N	Mean	S.D.	S.E.
Information Quantity	4	87	4.41	1.51	0.16
	8	92	5.01	1.46	0.15
	12	83	5.54	1.18	0.13
Guidance	No	131	4.36	1.58	0.14
	Yes	131	5.27	1.39	0.12
Tailored Information	No	131	2.97	1.71	0.15
	Yes	131	4.97	1.55	0.14

S.D. = Standard Deviation, S.E. = Standard Error

The manipulation of filtering was also perceived properly by the subjects. When the filtering capability was not provided, subjects reported lower levels of guidance (mean = 4.36, S.D. = 1.58) and tailored information (mean = 2.97, S.D. = 1.71) than when it was provided (respectively, mean = 5.27, S.D. = 1.39 and mean 4.97, S.D. = 1.55). A further assessment of manipulation validity is to compare the significance of the differences between groups via t-tests. T-test results are given in Table 3-7 below.

Table 3.7. Independent Samples T-Tests for Manipulation Checks

Group Comparison	E.V. assumed	Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig.	Mean Difference	S.E. Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Information quantity: 4 and 8 features	Yes	.12	.726	-2.69	177	.008	-.60	.22	-1.04	-.16
	No			-2.69	176	.008	-.60	.22	-1.04	-.16
Information quantity: 4 and 12 features	Yes	3.20	.075	-5.42	168	.000	-1.13	.21	-1.54	-.72
	No			-5.45	162	.000	-1.13	.21	-1.54	-.72
Information quantity: 8 and 12 features	Yes	2.01	.158	-2.62	173	.009	-.53	.20	-.93	-.13
	No			-2.65	171	.009	-.53	.20	-.93	-.14

Guidance (yes / no)	Yes	1.82	.179	-4.95	260	.000	-.91	.18	-1.27	-.55
	No			-4.95	256	.000	-.91	.18	-1.27	-.55
Tailored information (yes / no)	Yes	3.85	.051	-9.92	260	.000	-2.00	.20	-2.40	-1.60
	No			-9.92	258	.000	-2.00	.20	-2.40	-1.60

E.V. = Equal variance assumed. S.E. = Difference. df = Degrees of Freedom

T-test statistics were computed in order to compare the significance of the differences between groups for the manipulation of information quantity such as the 4 features group vis-à-vis the 8 features group and 12 features group, and the 8 features group vis-à-vis the 12 features group. The sorting / filtering capability was checked with items dealing with the possibility or not to obtain tailored information from the website during the browsing experience (Loiacono et al. 2007). The t-tests suggest that, as expected, all groups differ significantly. Consequently, we can conclude that the manipulations in the experiment are valid and that subjects are manipulated as intended (Straub et al. 2004). The preceding results thus suggest that the dataset can be further analyzed to test hypotheses.

3.6. Analyses

Linear regression analyses were used for testing the model. We first tested the influence of control variables, - namely age, experience with online purchase, experience in using spreadsheets, in using websites, age, and the fact of owning or not an MP3 player – on each dependent variable. Of these control variables, only gender had a significant influence on perceived information quality and information satisfaction. Female subjects perceived information had greater quality ($B=.131$, $p < .05$), and were more satisfied with information ($B=.17$, $p < .010$). When included in the model, the control variables were no longer significant. For this reason, we removed them from the model and only included hypothesized relationships.

We then tested linear relationships before testing the posited curvilinear one in a second step.

The results show that information satisfaction is a significant predictor of intention to use (B=.28, p < .000). Information quality as well significantly impacts intention to use (B=.44, p < .000), as posited and consistent with the DeLone and McLean's IS success model (DeLone et al. 2003). The relation between information quality and information satisfaction is also strong and significant (B=.80, p< .000). Then, choice uncertainty significantly impacts perceived information quality (B=.40, p< .000).

Regarding the influence of information characteristics variables on information quality we found content (B=.31, p < .000), accuracy (B=.28, p < .000) and format (B=.32, p < .000) are relevant antecedents of information quality. The variance of information quality explained by these three constructs is high with R^2 = .61. Observed power for all these relationships is above .90. Overall, posited direct linear effects in the model are thus well supported. The results of the linear regression analyses are given in Table 3-8 below.

Table 3.8. Path Coefficients

I.V.	D.V.	R2	Adjusted R2	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
				B	S.E.	Beta		
(Constant)	Intention to use	.462	.458	.45	.26		1.73	.085
Satisfaction				.31	.08	.28	3.71	.000
Information Quality				.50	.09	.44	5.80	.000
(Constant)	Satisfaction	.633	.631	1.06	.18		5.87	.000
Information Quality				.81	.04	.80	21.17	.000
(Constant)	Information Quality	.605	.60	.31	.23		1.36	.176
Content				.34	.06	.31	5.62	.000
Accuracy				.27	.06	.28	4.98	.000
Format				.27	.04	.32	6.50	.000
(Constant)	Information Quality	.163	.16	2.42	.30		7.95	.000
Choice Uncertainty				.41	.06	.40	7.12	.000

I.V. = Independent Variable; D.V. = Dependent Variable; S.E. = Standard Error

We then tested whether there was a curvilinear relationship between information quantity and information quality. We tested the curvilinear relationship in two steps with linear regression analyses. There is a curvilinear relationship between information quantity and information quality if there is: 1) a significant positive relationship between quantity and quality from 4 to

8 features and 2) a significant negative relationship between quantity and quality from 8 to 12 features. The results of the linear regression analyses are given in Table 3-9 below.

Table 3.9. Impacts of Information Quantity on Perceived Information Quality

Features	R2	Adjusted R2	I.V.	D.V.	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
					B	S.E.	Beta		
4 to 8	.001	-.004	(Constant)	Perceived Information Quality	4.21	.33		12.70	.000
			Quantity		.03	.05	.04	.51	.611
8 to 12	.021	.015	(Constant)		3.67	.50		7.33	.000
			Quantity		.09	.05	.14	1.91	.057
All	.021	.017	(Constant)		4.03	.22		18.32	.000
			Quantity		.06	.03	.14	2.35	.019

I.V. = Independent Variable; D.V. = Dependent Variable; S.E. = Standard Error

Unexpectedly, the results indicate an influence of information quantity on information quality neither between 4 and 8 features nor between 8 and 12 features. However, when we posit a linear relationship between information quantity and perceived quality, we find a positive, significant relationship ($t=2.35$, $p < .019$) with a small $R2 = .017$. In fact, this result is consistent with prior research that showed that information quantity and quality are linked, studies that maintain that greater amounts of information suggesting higher information quality (Keller et al. 1987). This result also reinforces the prior research of O'Reilly (1980) who suggest that there is still a conventional wisdom that "more information is better" (p. 694). He stresses that this belief and generally associated behaviors can be a problem in organizations because providing more information is often linked with lower decision making performance.

How do sorting and filtering capabilities influence these relationships? The step that follows is thus to test whether filtering and sorting capabilities have a moderating effect on the influence of information quantity on information quality. In order to test this relationship, we performed a two step regression analysis with a main effect model and a direct effect model (Chin et al. 2003; Goodhue et al. 2007). The moderation term has been calculated by multiplying filter x quantity. In testing for the moderation effect, the main effects model is compared to the moderation effect's one. The results are shown in Table 3-10 below.

Table 3.10. Test of the Interaction Effect

Model	R2	Adjusted R2	I.V.	D.V.	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
					B	S.E.	Beta		
Direct Effects	.078	.071	(Constant)	Perceived Information Quality	3.69	.23		16.07	.000
			Quantity		.06	.02	.15	2.49	.013
			Filter		.64	.16	.24	4.00	.000
Interaction Effects	.08	.07	(Constant)		3.53	.30		11.65	.000
			Quantity		.08	.04	.20	2.35	.020
			Filter		.97	.43	.36	2.26	.025
			Filter x Quantity		-.04	.05	-.14	-.81	.416

I.V. = Independent Variable; D.V. = Dependent Variable; S.E. = Standard Error

The results show that providing filtering and sorting capabilities is significantly and positively related with perceived information quality (B = .24, p <.000). As well, as shown earlier, information quantity is positively related with perceived information quality (B = .15, p <.013). In the interaction effects model, the interaction term is not significant (B = -.04, p <.416). While Chin et al. (Chin et al. 2003)contend the interaction term should be significant, Carte and Russel (2003) argue that one should only look at the variation of the R^2. They suggest the calculation of an F statistics such that should be significantly greater than 1. The F is given by the equation (E) below:

$$\textbf{(E):}\ F\left(df_{mult}-df_{add}, N-df_{mult}-1\right)=\frac{\Delta R^2/\left(df_{mult}-df_{add}\right)}{(1-R^2_{mult})/(N-df_{mult}-1)}$$

Based on the results given in Table 10, above, F = .000. Consequently, according to the procedure of Carte and Russel (2003), there is no moderating effect of sorting / filtering capabilities on the influence of information quantity on perceived information quality. The results of hypotheses are summarized in Table 3-11 below.

Table 3.11. Summary of Hypotheses

#	Hypotheses	Validation
1	Information satisfaction will positively influence intention-to-use.	YES
2a	Information quality will be positively related to intention-to-use.	YES
2b	Information quality will be positively related to user satisfaction.	YES
3	Uncertainty will be negatively related to perceived information quality.	YES
4	Information quantity will display a curvilinear relationship with information quality.	NO[1]
5	Filtering and sorting capabilities will raise the overload point on the curvilinear relationship between information quantity and information quality.	NO[2]

[1]A significant positive, linear relationship has been found between information quantity and information quality.
[2]A significant direct effect of sorting/filtering capabilities on perceived information quality has been found.

3.7. Discussion

This study extends prior research by showing that perceived information quality is positively impacted by information quantity while. Its main contributions are summarized in Table 3-12 below.

Table 3.12. Summary of Contributions

Element	Contributions
Information quality versus information quantity	• Provides a better understanding on the interrelations between information quality and information quantity and the ISM. • Suggests a significant positive relation between information quantity and information quality.
Mechanisms to cope with information overload	• Better understanding of the role of coping mechanisms to mitigate the harmful effects of information overload.
Usage behaviors and attitudes	• Better understanding on the impact of information overload on information quality and downstream on usage and satisfaction outcomes. • Emphasizes a contradiction between user interests in large amounts of information and the often reported lower decision making performance with this information.

Unexpectedly, we did not find a curvilinear relationship between information quantity and information quality. Prior researcher demonstrated that a such pattern of relationship does exist between information quantity and choice quality (e.g., Hahn et al. 1992; Lee et al. 2004; Lurie 2004). However, it has been noted that this relationship is more likely to occur under time pressure (Evaristo 1993).

The linear positive relationship between information quantity and perceived information quality is surprising, and its implications deserve some explanation or at least speculation.

Individuals may prefer larger amounts of information from systems. But, ironically, when overloaded, users make poorer decisions. This paradox has been observed by O'Reilly (1980) in his investigation of information overload in organizational settings. Our results show that this may also hold in an online purchase decision making context. Furthermore, we found that in each three information quantity settings, individuals had the right information to make a decision about which MP3 player to buy. Users are probably more confident in their choice when they are overloaded, because their choice results from the analysis of larger amounts of information and greater processing effort.

Another finding is on the influence of filtering and sorting capabilities on information quality. Information sorted and filtered according to user needs leads to the benefit of higher perceived information quality. Unexpectedly, filtering and sorting capabilities had no moderating influence on the relationship between information quantity and information quality. Thus, these mechanisms are valued by system users not for their capability to mitigate information overload, but rather for the greater quality of information they allow to obtain with systems. Meanwhile, it is likely that users rely more on their own spontaneous filtration efforts to mitigate the negative effects of information overload rather than on system embedded sorting and filtering mechanisms (Schultze et al. 1998).

These results have important implications. It confirms prior research suggesting the relevance of information quality as an antecedent of IS success (DeLone et al. 1992; DeLone et al. 2003). Indeed, perceived information quality was found to be positively related with user satisfaction and intention to use. Additionally, we suggest that the quantity of information provided by a system should also be taken into account when evaluating the determinants of system success. Specifically, although we found no support for a curvilinear relationship, information quantity has still significant linear influences on perceived information quality.

While prior research has mainly focused on the impacts of information quality on IS success (DeLone et al. 1992; DeLone et al. 2003; Rai et al. 2002; Seddon 1997), this research thus suggests a more complete view of IS success should include the effects of information quantity. Specifically, we posit it as an antecedent of information quality, as shown in Figure 3-2.

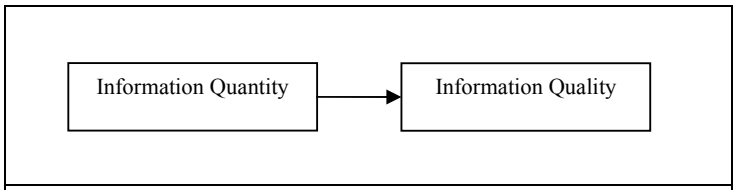


Figure 3-2. The Missing Path in IS Success Research

Then, the results suggest that system users are likely to attribute more value to systems that provide the largest amounts of information, without consideration for their own decision quality. While subjects may feel more confident when making their decisions with larger amounts of information (O'Reilly 1980), they probably make simultaneously poorer decisions. System designers should thus be cautious of providing systems displaying the only amount of information that is needed to make decisions to users. Additionally, they would probably need to train users to understand that processing large volumes of information may be satisfying, but there are important risks that it leads to poorer decisions.

The results suggests that there might be a contradiction in what individuals value in systems (i.e., greater perceived quality of information with large amounts of information), and the reality of IS success (large amounts of information are related with poorer decisions). Such a contradiction should be taken into account in IS success research, and arguably, the ISM could be completed with the posited influences of information quantity.

This research is not without some limitations. We review these next along with future research directions.

3.8. Limitations and Future Research

The study has several limitations that we are cognizant of. First, the design adopted is that of a decision making task in an online shopping context. It is likely that people respond differently to different overloading situations. Consequently, we cannot generalize the findings of the present study to all information overload situations.

A second limitation lies in that we assessed information overload only as an overabundance of relevant information. That is, all information presented to subjects could be considered as useful for making a decision. Other researchers define information overload more as an overabundance of irrelevant information (Ackoff 1967) inducing individuals to spend much time in filtering, sorting, of avoidance strategies (Schultze et al. 1998).

Another aspect we did not take into account is the influence of individual motivation to perform a particular task in the perception of overload. In practice, individuals can choose to do otherwise, for example using other websites, finding information about an item to buy in a store or in a magazine with expert advice prior to their purchase, etc. In such circumstances, they may have a wider range of coping mechanisms that would allow them to deal with overload more efficiently. Thus, although the online situation to which our subjects were exposed had a reasonable critical realism, it still offers, like any other experiment, a view of reality that is narrower than what can be done in a real world setting. New settings should be further explored in future research for enhanced external validity.

Our research investigated the influence of information quantity on IS success outcomes. The task consisted of making a decision with structured information displayed on a website. While our research applies well to structured information, further research is needed to evaluate what are the implications of unstructured information on user strategies to cope with overload.

This issue is particularly important since managers most often need and use unstructured information (Eisenhardt 1990; Mintzberg 1972; Ungson et al. 1981; Wetherbe 1991). According to Ungson et al. (Ungson et al. 1981, p. 121) "the problem faced by managers can be described as ill-structured due to (1) the ambiguity and incompleteness of problem-related information, (2) the extent to which problems are continually defined and redefined by managers, (3) the lack of a program for the desired outcomes, (4) the possibility of multiperson influences, and (5) the extended period in which a decision is made" (p. 121). Information aimed at managers charged with such tasks is often unstructured and available from multiple sources.

Several areas should be investigated in future research. Specifically, researchers and practitioners should look for ways to improve filtering mechanisms so as to better take into account user needs. In the context of a search for information on the web, a solution to deal with overload might be including advanced features and filters to systems drawing from semantic algorithms (Embley 2004). Embley (2004) recognizes that people often receive more information than they can process and that this poses serious information processing and decision making problems. According to him, decision makers, because of the information quantity issue, will need to rely increasingly on systems that allow automated decision making in a number of areas. He further argues that "a resolution of these problems requires software with semantic understanding – a grand challenge of our time" (p. 3). Moreover, "we must build information agents and process agents that we can trust to give us the information we want and need and to negotiate on our behalf in harmony with our beliefs and goals" (p. 3). This semantic understanding can be provided by extraction ontologies that can identify, classify, and make understandable semi-structured information.

In many respects, such semantic filters might help in resolving the contradictions we

highlighted between information overload and perceived information quality. Indeed, the information quantity issue is not likely to be any longer a problem with such algorithms, while in the same time decision quality should increase with greater amounts of information. In brief, if we could find ways to automate information processing with semantic algorithms, large amounts of information to process would probably not be such a problem. Indeed, other researchers have developed algorithms allowing to condense textual information automatically and to provide relevant information summaries (Morris et al. 1992). Thus, arguably, information processing strategies for unstructured problems differ to those for structured problems (Ungson et al. 1981) as do the system filters.

Another aspect that is not analyzed in this study is the role of the types and sources of information. According to Hanser and Muchinsky (1978), both the type and the sources of information are important for workers and influence how they use information in performing their tasks. They further suggest that individuals might have preferences for receiving information of certain type and from certain sources. The implication for the current research is that depending on the sources and types of information, workers might cope differently with information overload. In addition, the advantages of filtering mechanisms might be contingent to individuals subjective preferences for certain type and sources of information. Some researchers also note that these various types and sources of information are often provided by organizations to workers depending on their work requirements or their work status (Hanser et al. 1978).

3.9. Conclusions

This study reveals new knowledge about the effects of information overload on system users. Contrary to expectations, we found no curvilinear relationship between information quantity and perceived information quality. Instead, we found a linear positive effect of information

quantity on perceived information quality.

The problem of information overload for system users makes it necessary for system designers to pay more attention to the phenomenon (Eppler et al. 2004). In fact, the effects of information quantity has long been neglected in prior research on IS Success and it was necessary to better acknowledge its influences. As well, practitioners paid little attention to this phenomenon and there is growing concerns about finding ways to solve this problem (Jacoby 1984; Keller and Staelin 1989; Lee and Lee 2004; Lurie 2004; Morris et al. 1992).

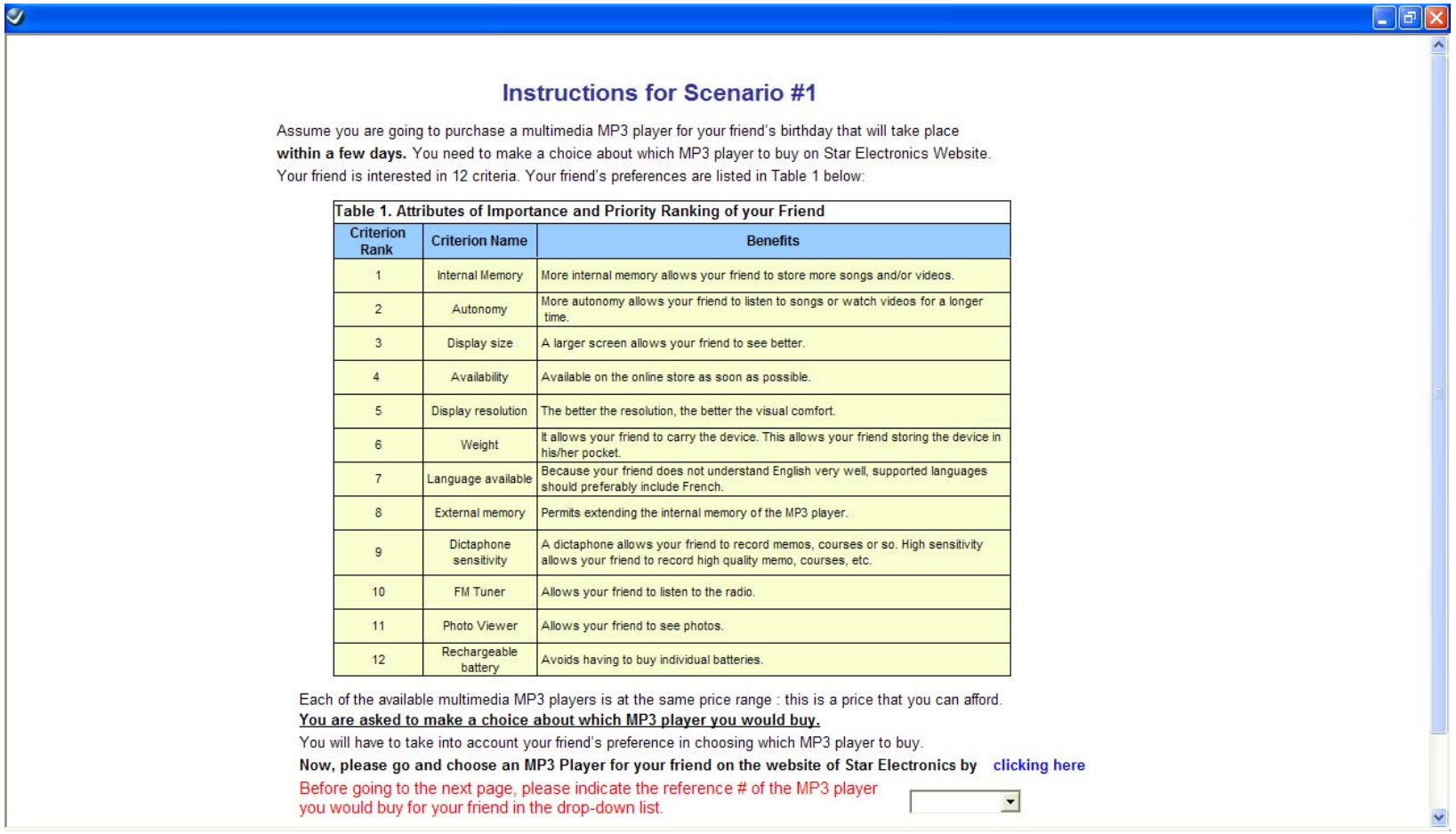
Filtering and sorting are among system features that can allow dealing with this problem (Ackoff 1967; Morris et al. 1992). Contrary to our expectations, we found no moderating influence of embedded sorting / filtering capabilities on perceived information quality. Instead, the results indicate that sorting / filtering capabilities embedded in systems have linear positive effects on perceived information quality.

Since information quality is a key antecedent of IS success (DeLone et al. 1992; DeLone et al. 2003), it is important to acknowledge its key antecedents. This study contributes to furthering this issue.

3.10. Appendix : Experimental Instrument

Table 3.13. Questionnaire Instrument

Question - Scale	Code	Wording
Information Quantity [1 - Very Little… 7- A Great Deal]	QUANT1	How much information do you think was displayed on this website?
	QUANT2	How much information did you have to process in making your choice?
Filtering/Sorting (A) [1- Not at All… 7 - A Lot]	GU1	How much help did this website provide you with in making your choice?
	GU2	How guided were you in making your choice?
Use of Sorting / Filtering Capabilities [1- Not at All… 7 - A Great Deal]	SORT1	To what extent did you use the sorting capabilities?
	SORT2	To what extent did you use the filtering capabilities?
Tailored Information [1 - Strongly Disagree…7- Strongly Agree]	TAIL1	This Website allows me to interact with it to receive tailored information.
	TAIL2	This website has interactive features which help me accomplish my task.
Choice Uncertainty [1 - extremely uncertain…7 - extremely certain]	UN1	Please rate the level of uncertainty of your choice.
	UN2	How certain did you feel making your choice about which MP3 player to buy?
Content [1 - Strongly Disagree…7- Strongly Agree]	CON1	This website provides the precise information I need.
	CON2	The information content of this website meets my needs.
	CON3	This website displays information that seems to be just about exactly what I need.
	CON4	This website provides sufficient information.
Accuracy [1 - Strongly Disagree…7- Strongly Agree]	ACC1	This website is accurate.
	ACC2	I am satisfied with the accuracy of this website.
Format [1 - Strongly Disagree…7- Strongly Agree]	FOR1	I think this website is displayed in a useful format.
	FOR2	The information on this website is clear.
Information Quality [1 - Strongly Disagree…7- Strongly Agree]	QUAL1	The website provides me with high-quality information.
	QUAL2	Overall, I would give the information provided by this website a high rating in terms of quality.
	QUAL3	Overall, I would give the information from this website high mark.
Information Satisfaction [1 - Strongly Disagree…7- Strongly Agree]	SAT1	Overall, the information I got from this website was very satisfying.
	SAT2	I was very satisfied with the information I received from this website.
Intention to Use [1 - Strongly Disagree…7- Strongly Agree]	IU1	I intend to use this system for making a decision about which MP3 player to choose in the future.
	IU2	I predict I would use this system for making a decision in the future.
	IU3	I plan to use this system for my next online purchases.
	IU4	If needed an MP3 player in the future, I would probably end up purchasing it on this website.



Instructions for Scenario #1

Assume you are going to purchase a multimedia MP3 player for your friend's birthday that will take place **within a few days.** You need to make a choice about which MP3 player to buy on Star Electronics Website. Your friend is interested in 12 criteria. Your friend's preferences are listed in Table 1 below:

Table 1. Attributes of Importance and Priority Ranking of your Friend

Criterion Rank	Criterion Name	Benefits
1	Internal Memory	More internal memory allows your friend to store more songs and/or videos.
2	Autonomy	More autonomy allows your friend to listen to songs or watch videos for a longer time.
3	Display size	A larger screen allows your friend to see better.
4	Availability	Available on the online store as soon as possible.
5	Display resolution	The better the resolution, the better the visual comfort.
6	Weight	It allows your friend to carry the device. This allows your friend storing the device in his/her pocket.
7	Language available	Because your friend does not understand English very well, supported languages should preferably include French.
8	External memory	Permits extending the internal memory of the MP3 player.
9	Dictaphone sensitivity	A dictaphone allows your friend to record memos, courses or so. High sensitivity allows your friend to record high quality memo, courses, etc.
10	FM Tuner	Allows your friend to listen to the radio.
11	Photo Viewer	Allows your friend to see photos.
12	Rechargeable battery	Avoids having to buy individual batteries.

Each of the available multimedia MP3 players is at the same price range : this is a price that you can afford.
You are asked to make a choice about which MP3 player you would buy.
You will have to take into account your friend's preference in choosing which MP3 player to buy.
Now, please go and choose an MP3 Player for your friend on the website of Star Electronics by clicking here
Before going to the next page, please indicate the reference # of the MP3 player you would buy for your friend in the drop-down list.

Figure 3-3. Experimental Website – Instructions to Participants (12 features)

#	NAME	INT. MEMORY	AUTONOMY	DISPLAY	EXT. MEMORY	RECH.BATTERY	DICTAPHONE SENSITIVITY	PHOTO	DISPLAY DEFINITION	TUNER	WEIGHT (GR.)	LANGUAGE	AVAILABILITY (DAYS)
1	YV-V7	3 GB	20	2.2"	No	No	3 - High	Yes	3 - High	Yes	40	FR/EN	10
2	AB-V9	3 GB	20	1.8"	Yes	Yes	3 - High	Yes	3 - High	Yes	40	EN	6
3	CE-V3	3 GB	20	1.8"	Yes	Yes	3 - High	Yes	3 - High	Yes	100	FR/EN	2
4	CE-U0	2 GB	14	1.8"	Yes	Yes	2 - Medium	No	3 - High	Yes	70	FR/EN	2
5	CE-6H	3 GB	14	1.5"	Yes	Yes	3 - High	Yes	3 - High	No	70	EN	10
6	CE-A5	2 GB	18	2.2"	No	Yes	3 - High	No	2 - Medium	Yes	40	EN	6
7	AB-C7	2 GB	20	1.8"	No	No	3 - High	No	3 - High	No	100	FR/EN	2

Figure 3-4. Experimental Website – MP3 Players Display (12 features)

Chapter 4

User Strategies of Adaptation in the Presence of Disruptive IT

Abstract

According to Benbasat and Barki (2007), systems usage has remained a black box in spite of the fact that the construct lies at the heart of a host of studies in the field. Exactly how do users interact with or use systems? Exactly how do they cope with information technology (IT), especially disruptive IT?

First, to answer such questions, we grounded our current work in Beaudry and Pinsonneault's Coping Model of User Adaptation (2005; CMUA), a model that explains user strategies appraising an IT event. These strategies are a response to threats and opportunities embedded in the IT event and are impacted by the level of control users have over the situation. In the current study, following CMUA, we develop and test measures for a deeper understanding of systems usage and user adaptation to IT through a 2x2 laboratory experiment.

Second, in order to further the latter analysis, this research focuses on the influence of espoused national cultural values (Srite et al. 2006) on user coping strategies of adaptation to disruptive IT. We posit espoused Uncertainty Avoidance (EUA) and espoused Individualism-collectivism (EIC) as individual differences variables that significantly impact user coping strategies to IT implementation.

The model has been tested with 209 undergraduate students from French and US universities. Overall, we found strong support for the CMUA model. Further, the results show that high

EUA individuals tend to adopt problem focused adaptive strategies more than low EUA individuals. We also found that EIC has significant moderating effects on the relation between control and coping strategies in opportunity conditions but not in threat conditions. It shows that more collectivistic individuals tend to be less problem-focused than more individualist ones. The results are then discussed and a future research agenda is proposed.

Keywords: Coping Model of User Adaptation; theory of coping; adaptation; systems usage; disruptive information technologies; threats; opportunities; control; benefits maximizing; benefits satisficing; disturbance handling; self-preservation.

4.1. Introduction

Implementing IT that is non-disruptive, that is systems that are compatible with previous systems or processes with which the users are already familiar, has long and distinguished history in business. These kind of non-disruptive technologies still offer challenges to managers, but the technology itself is not inherently alien.

The same cannot be said about disruptive technologies. A disruptive innovation is "a novel idea or behavior that, when introduced in organizational settings, causes dramatic changes in the structure of work processes" (Sherif et al. 2006, p. 341). When the technology is "disruptive," evidence suggests that managers and users do not respond nearly as well. Disruptive IT innovations involve pervasive and radical changes in the organization and in organizational processes (Lyytinen et al. 2003, p. 32).

What are recognizable examples and classes of disruptive technologies? Technologies such as Enterprise Resource Planning (ERP) systems can be considered to be disruptive technologies since the organization is almost always overhauled during the process of implementation (Davenport et al. 1989; Hammer 1990). Therefore, individuals are forced to adapt in different ways, depending on the degree of the disruption caused by the IT. With such large integrated system like ERPs, researchers highlighted many risks of failure leading to undesirable outcomes (Bernard et al. 2004). These risks of failure are linked to the organizational context of implementation, to the system, but also to system user expectations and perceptions of system uncertainty (Larif et al. 2004). For these reasons, it is important to learn how employees adapt to IT in order to better respond to their needs. Also for these reasons, understanding how users adapt to disruptive IT is the main objective of this study.

What do we currently know about how users adapt to disruptive IT? Scholarly models of user

adaptation to date are either piecemeal or not fully tested, according to Beaudry and Pinsonneault (2005). Moreover, while some researchers have dealt with aspects of the issue, there has been no integrated approach before Beaudry and Pinsonneault's CMUA, or coping model of user adaptation (2005). These researchers recognized that, although variance or process approaches are each inconclusive in and of themselves, there can be a cumulative effect of studies. Hence, although Beaudry and Pinsonneault (2005) assert this point, they did not themselves attack the question through multi-method approaches. Therefore, additional integrative insights are needed to pull together prior piecemeal views.

To date, variance approaches have not studied user adaptation in depth; most frequently, variance researchers consider it to be implicit in system usage. Pointedly, by not considering how users adapt to technologies, adoption models can lose predictive power when applied to organizations.

How then can a variance approach be utilized to address user adaptation? User adaptation strategies can be modeled as a mediating factor between system attributes and system usage and in this way capture user social embeddedness. Subsequently, this will allow us to better understand the contingencies surrounding use beliefs and use of IT in organizations.

Beaudry and Pinsonneault's work (2005) is conceptually ground-breaking in that it explicitly models user adaptation. In proposing CMUA, however, they did not develop scales to measure the variables in CMUA and were only able to test it qualitatively with a sample of twelve managers. A key question, therefore, is whether their results will hold when examined through a variance approach and a much larger sample. The basic issue is rectitude: Exactly how good is their model? Second, although the Beaudry and Pinsonneault (2005) model may pass tests in single culture settings, will it be prove to be invariant with respect to user cultural values?

There is a significant literature that indicates that culture influences system user interactions with respect to IS implementation (Srite et al. 2006; Straub 1994; Straub et al. 1997), but Beaudry and Pinsonneault (2005) do not raise the question of how culture might affect user adaptation strategies. Our research questions are, therefore: (1) Is there empirical support for CMUA (using a variance approach) as applied to the setting of disruptive IT? (2) What influence do user cultural values have on how they adapt to systems?

In order to answer to these questions, the present work: (1) develops and validates an instrument for empirically measuring user strategies of adaptation to IT, (2) shows how user strategies of adaptation to IT can inform user interactions through an enhanced model of CMUA (Beaudry et al. 2005), (3) demonstrates the need to take user strategies of adaptation into consideration in future research related to IT adoption and use, and (4) shows how espoused uncertainty-avoidance and espoused individualism-collectivism influence user adaptive strategies.

We first motivate the need to study user adaptation with a review of pressing major issues remaining in the IS acceptance and use literature. Next, assessing both the variance and process traditions of research in this domain, we discuss how user adaptation has been conceptualized in the past. In this section, we point out the difficulties posed by current piecemeal views of user adaptation. We then model user strategies of adaptation, heavily based on CMUA and the theory of coping (Lazarus et al. 1984), but augmented by the posited influence of cultural values. In the subsequent section are research methods and research design. The design employed was a 2x2 repeated measures, scenario-based laboratory experiment. The final section discusses the contributions and limitations of the work, punctuated by a future research agenda.

4.2. Why Study User Adaptation to Disruptive IT?

Despite its importance in our understanding of user interaction with IT, few models have attempted to explain user adaptation to IT. This is especially true for quantitative research in information systems. There is thus a need to study user adaptation to disruptive IT.

THE NEED TO UNDERSTAND USER ADAPTIVE STRATEGIES TO IT. In response to concerns raised in the technology acceptance and usage literature, IS researchers[2] now argue for an effort to improve our current models, by building richer models that explain a wider set of behaviors. Of course, technology acceptance and usage is one of the dominant research streams in IS aiming at explaining how individuals behave with respect to IT. Related studies rely on models such as the Theory of Planned Behavior (TPB) (Ajzen 1991), the Technology Acceptance Model (TAM) (Davis 1989)and latter the Unified Theory of Acceptance and Use of Technology (UTAUT), a model that synthesizes key constructs from eight competing models(Venkatesh et al. 2003). Overall, these models link individual usage of a technology to user beliefs and attitudes and position perceived usefulness and perceived ease of use as key determinants of the acceptance and use of a technology.

For some researchers, these models, albeit widely used in IS research, do not address or only partially address a number of questions that seriously undermine their applicability (Bagozzi 2007; Benbasat et al. 2007; e.g., Burton-Jones et al. 2006; Isaac et al. 2006b). In keeping with this line of thinking, we identify four major limitations that need to be addressed. in user acceptance models First of all, while models of user acceptance of IT may apply well in voluntary usage contexts, they do not work as well in mandatory usage contexts (Agarwal et al. 1997; Brown et al. 2002; Karahanna et al. 1999a; Karahanna et al. 1999b; Straub et al. 1995).

Since technology usage is often mandatory, it is important to assess user behavior when faced

[2] Interested readers are invited to see the special issue of *Journal of the Association of Information Systems,* June 2006.

with such systems. Second, many models assume that users face no impediments in the course of system usage. On the contrary, users often do not have a total control over situations of usage (Bagozzi et al. 1990). Third, extant models of IT acceptance and usage do not appropriately model the kind of technology involved in the implementation process. Because users may adapt differently to more complex technologies than to less complex ones (Gallivan 2001), it is important to assess user adaptation to disruptive IT in particular. Differently, Isaac et al. (2006b) suggested that the appropriation of IT such as mobile technologies necessitated taking into account both individuals' professional and private context of usage. Specifically, they suggest the individual context of usage can foster organizational adoption of mobile IT that, in the context of their study, can be considered as disruptive. Last but not least, most user IT acceptance models assume user adaptation without conceptualizing it. This creates a black box of user strategies of adaptation that we need to open (See Figure 1). It is important, indeed, to explore the hidden dimensions of these models, which we believe to be user personal strategies of adaptation to IT.

VOLUNTARY V.S. MANDATORY SYSTEM USAGE. Researchers have argued that theory of reasoned action-based acceptance models make the important underlying assumption that system use is voluntary (Karahanna et al. 1999a; Straub et al. 1995). But it is clear that system use in organizations is often mandatory, in practice at least, which implies that users have no other alternative but to use the system. Researchers such as Brown et al. (2002) suggest that the results with TAM models differ, whether IT usage is mandatory or voluntary. Therefore, users must personally adapt to it (Isaac et al. 2006a). Isaac et al. (2006b) suggest that user adaptation invoke reinvention and appropriation mechanisms. They further suggest that traditional models of adoption of IT do not always permit to understand why individuals can rationally choose not to adopt a technology.

IMPEDIMENTS TO USAGE. The second limitation of most IT acceptance models is that they assume users encounter no impediments when they adopt new technologies. In fact, users are faced with many situations that are not totally under their own control (Bagozzi et al. 1990). Bagozzi et al. (1992b) suggest that, in models based on the theory of reasoned behavior in particular, users are assumed to enjoy a trouble-free implementation process when they decide to use new technology (Bagozzi et al. 1992b, p. 661):

Although attitudes toward actions are clearly important determinants of the adoption of computer technology, it is important to clarify their boundary conditions. The models that incorporate these attitudes presume that when one forms an intention to act, e.g., use expert system Y, he or she assumes, implicitly at least, that if one tries to act, no impediments will likely stand in the way, such as ability limitations, time constraints, environmental contingencies, and/or unconscious habits. In this sense the formation of intentions applies to behaviors that are largely non-problematic (p. 661).

Since impediments to system usage do exist, users must adapt, depending on the nature of those impediments, in order to use the systems. The identification of adaptive strategies is, therefore, a major issue for IS researchers, we would argue.

DISRUPTIVE TECHNOLOGIES. The third limitation of IT acceptance models is their limited area of applicability to nondisruptive technologies (Benbasat et al. 2007; Gallivan 2001; Straub et al. 1995). According to Gallivan et al. (1994):

In contrast to incremental change, where established structures, processes, and knowledge are extended and augmented, radical change replaces the status quo with a new order of things and as a result may create serious disruptions in structures, processes, operations, knowledge and morale (p. 325).

In fact, models of user acceptance have only lightly and loosely investigated the effect of type of technology on user acceptance.[3] Indeed, some researchers have suggested that our traditional acceptance models apply only to non problematic technologies (e.g., Gallivan 2001). They do not apply to "more complex technologies and adoption scenarios which require high levels of coordination across multiple adopters, or where the technology has a high knowledge burden" (Gallivan 2001, p. 56). Large integrated system implementation can also contradict the existing organizational structures and culture. For example ERP has embedded a transversal, process oriented vision of the organization. When implemented in a bureaucratic organization characterized by top-down decisions, multiple layers of authorization, ERP systems' implementation can face user or unit resistance to change. In that, researchers highlighted cases of ERP system implementation whereby the organizational structures did not change significantly and instead remained bureaucratic rather than process oriented (Saint-Léger 2004). In such a context, it is critical to understand how multiple users, witnesses, actors, and potential "victims" of radical IT change adapt to it. Other researchers have shown, for example, that impediments such as goal conflicts can spring up between reengineered work processes during the implementation of disruptive IT (Sherif et al. 2006). Consequently, it is little wonder that users may adapt in sundry ways to these technologies.

Researchers have studied IT in organizations that were experiencing disruptions, but they have not analyzed how disruptive these technologies were perceived to be. What we posit here is that while all IT is disruptive to some degree, the most disruptive technologies are more likely to invoke strategies of adaptation that can significantly impact actual use. Such IT can indeed change work environment equilibrium in organizations (Lassila et al. 1999) and

[3] It needs to be noted, however, that there is evidence that the type of technology can influence the validity of user acceptance models. For example, it has been shown that those models are likely to be more suited for productivity-oriented technologies, and less appropriate for technologies such as hedonic information systems (Van der Heijden 2004)

require certain important re-adjustments between the IT and the other components of organizations.

Prior research also suggests the way that IT is implemented can be critical for users. For example, Gallivan et al. (1994) suggest that radical innovation does not necessarily follow a fast implementation scheme, for example like that advocated by Hammer (1990). The researcher reports a case of gradual and successful introduction of a radical IT innovation. The implementation scheme was episodic, following phases rather than proceeding from a fast, radical overhauling of the organization. Gallivan et al. (1994) argue that while this implementation scheme might not and should not be applicable in all organizational contexts or for all IT innovations, it can facilitate user adaptation to new implemented IT:

Not required to assimilate both changes immediately and in full, these employees were able to more gradually accommodate the changes. Because IS managers had provided an opportunity for employees to adapt the implementation of IE [Information Engineering], and IEF [Information Engineering Facility] to their own schedules, the changes were not perceived as overwhelming or threatening – a common response to radical change in the workplace (p. 332).

The findings of Gallivan et al. (1994) thus suggest that both the nature and the pace of organizational change can play a role in how individual users eventually respond and adapt to IT implementations.

By way of contrast, the BPR perspective posits that the implementation of such systems as ERP must be fast-paced and allow as little customization and system adaptation as possible (Davenport et al. 1989; Hammer 1990). Rather, the entire work process needs to be overhauled, and users, rather than the ERP, must adapt to the technology through training and work process redesign. One perhaps flippant argument in opposition to BPR views is that

studies indicate widespread failure in the implementation of ERP projects, suggesting that much remains to be learned about how users adapt to ERPs. Furthermore, ERP users, despite the constraining nature of ERP systems, can still adapt to these systems in different ways, for example, subverting system use or reinventing their use of the system (Boudreau et al. 2005; Hammer 1990).

THE BLACK BOX OF USER STRATEGIES OF ADAPTATION. The previously delineated limitations of extant models of IT acceptance and use highlight the fourth and last research limitation: of the fact that user adaptive strategies have been treated as a black box. Models of IT acceptance and use based on TAM do not conceptualize or test user adaptation (Benbasat et al. 2007). The argument to be developed next is that, as shown in Figure 4-1 below, this gap creates a need to open the "black box" between usage behaviors and their most often frequently studied antecedents.

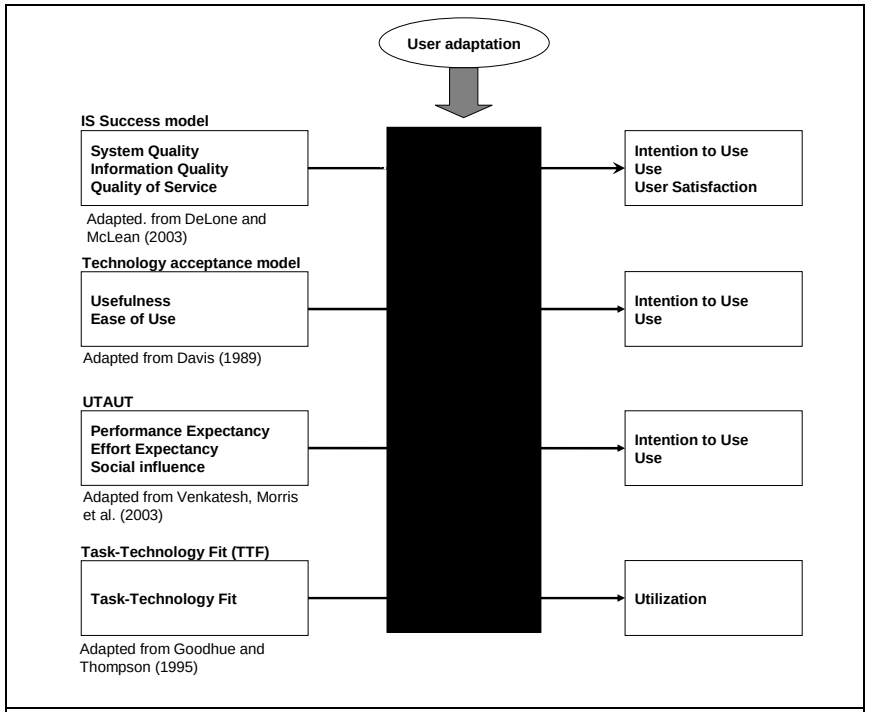


Figure 4-1. The Black Box of User Strategies of Adaptation

As shown in Figure 1, antecedents of intention to use a technology include information

quality variables in the Information System Success Model (ISM) (DeLone et al. 2003), perceived usefulness and ease of use in TAM (Davis 1989), and a set of variables grouped under the concepts of performance expectancy, effort expectancy, and social influence in UTAUT (Venkatesh et al. 2003). The large body of research following or refining these conceptualizations has analyzed several factors that permit us to better understand what motivates individuals to use IT. This body of work also yielded insights into the contingencies influencing IT use. These factors include top management commitment (Lewis et al. 2003), type of task (Fang et al. 2005), fit between the task and the technology (Goodhue et al. 1995), hedonic characteristics of the system (Van der Heijden 2004), intrinsic motivations of individuals (Venkatesh 1999; Venkatesh 2000), personal traits (Brown et al. 2004), gender (Gefen et al. 1997; Venkatesh et al. 2000), national culture (Straub et al. 1997), individual and institutional factors (Lewis et al. 2003), subjective norms (Venkatesh et al. 2003), and trust (Pavlou et al. 2006; Pavlou et al. 2004). All of these factors have been shown to significantly influence user decisions to adopt a technology. But, notably, in none of these models does user adaptation explicitly appear.

Researchers are more and more aware of and concerned with this limitation in the IT acceptance and use stream of research. There are now, indeed, important advocates of shifting in the way we study how users react to IT. For example, Benbasat and Barki (2007) specifically argue that PU and PEOU are black boxes that are not easy to open nor easy to apply to all technologies. They recommend that researchers improve the conceptualization of system usage, an issue also addressed by Burton-Jones and Straub (2006). They finally suggest including user adaptation in our conceptualizations. As Benbasat and Barki (2007) state:

> As a solution we propose that researchers broaden their perspective of system use from one that exclusively focuses on a narrow "amount" view of users'

> direct interaction with systems to one that also includes *users' adaptation*, learning, and reinvention behaviors around a system (p. 215).

Benbasat and Barki (2007) are unambiguously arguing that IS researchers build richer models to take into account a broader range of behaviors instead of focusing only on direct relationships between use behaviors and their antecedents. User strategies of adaptation can, to some extent, we believe, be conceptualized as mediating or moderating the relations between usage behaviors and their antecedents. Such a conceptualization enriches the literature on acceptance, going beyond the overly simplistic relationships often posited by researchers. Although stated differently, Bagozzi et al. (1992b) identifies a similar gap in the literature, which is mostly still unresolved:

> A gap exists in the etiology of behavior between psychological reactions to objects and the actions taken in relation to those objects. In other words, attitudes towards objects do not cause behaviors but rather specific motives to act do. People do not necessarily adopt technologies because of their features per se. They do so more for the benefits to which the technologies lead (p. 660).

What Bagozzi et al. (1992b) highlight is precisely the "gap" in our conceptualizations of acceptance and usage, a gap that means that the literature is silent on the nature of what we call the "black box" of user strategies of adaptation.

Concluding from this is that positivist, quantitativist research in IS, in particular, has focused on usage behaviors – on outcomes such as usage or intention to use – that are far removed from antecedents. What seems clear is that a complementary view of user adaptation allows a broader range of individual responses to IT (Benbasat et al. 2007), one that also implies an interesting agency perspective (Beaudry et al. 2005).

4.3. Theoretical Framework: CMUA

To conceptualize and measure user adaptation to IT, the present study is based on CMUA.

CMUA itself is based on the well established theory of coping (Lazarus et al. 1984). Applied to IS, this theory permits us to open the black box of user strategies of adaptation, and to predict user behaviors in complex environments.

4.3.1. The Value of Synthesizing Piecemeal Views of User Adaptation

As noted above, user adaptation to IT has been studied through both the variance and process tradition of research. Neither, however, has offered a completely satisfying explanation of the phenomenon. Furthermore, piecemeal evidence motivates the need for a unified model. As detailed by Beaudry and Pinsonneault (2005), major studies dealing with user adaptation to IS have defined user adaptation at an individual level through various concepts such as adjustment (Majchrzak et al. 2000), adaptation (Tyre et al. 1994; Tyre et al. 1996), appropriation (Orlikowski 1996), mutual adaptation (Leonard-Barton 1993) and reinvention (Leonard-Barton 1988; Rice et al. 1980) CMUA is an attempt to take into account a possible complementarity between variance and process approaches. Newman and Robey (1992) suggest what should each approach should look for:

Ideally, factor research should establish strong empirical connections between antecedent conditions and later outcomes, while process research should examine the streams of activities that explain these connections (214).

These researchers, even though they consider variance and process approaches should not be combined in a single model, do recognize the value of each approach, depending on research purpose. Although both approaches can inform each other, few have attempted to reconcile them, especially in the context of user adaptation studies. However, as suggested by several authors, this perhaps risky attempt could help to build richer models (Beaudry et al. 2005; Gallivan 2001; Shaw et al. 1997b). Resulting from such an attempt, CMUA made an important step toward explaining user adaptation to IT. Indeed, taking into account findings

of both variance and process tradition of research, CMUA is, arguably, a major step toward a unified view of user adaptation. First, they attempt to reconcile variance and process traditions of research, which facilitates the opening up of the black box of system usage, thereby profiting from the rich material provided by both traditions. Second, CMUA articulates a user-centered perspective, encouraging researchers to focus on agency behaviors (Beaudry et al. 2005).

In addition to the separate evolution of the variance and process traditions of research in IS, researchers have identified multiple, fragmentary approaches to IS usage (Bagozzi 2007) that together make the research stream increasingly confused. Research related to user adaptation can, for example, be found in the user acceptance and usage stream. With respect to the very successful Technology Acceptance Model (TAM) stream of work, many now urge alternative models for investigating related phenomenon. For example, according to Bagozzi (2007):

The IS field risks being overwhelmed, confused, and misled by the growing piecemeal evidence behind decision making and action in regard to technology adoption/acceptance/rejection. What is needed is a unified theory about how the many splinters of knowledge cohere and explain decision making (p. 245).

In an attempt to respond to these concerns, we suggest studying user adaptation via CMUA. Beaudry and Pinsonneault (2005) define the adaptation process as a one-sided coping process. They consider that "coping deals with the adaptational acts that an individual performs in response to disruptive events that occur in his/her environment"(p. 494). In accordance with the Theory of Coping (Lazarus et al. 1984). Beaudry and Pinsonneault (2005) assert that IT users employ two processes to cope with a disruptive IT event. The first process is an appraisal whereby individuals evaluate the importance of the event given their own situation and interests. The second process is the process of coping. To cope, users attempt to manage

the situation (Lazarus et al. 1984). This is what the authors called the "coping effort". Applied to IS, CMUA approach to user adaptation can enrich our view of individual reaction to IT and go beyond several limitations found in IS acceptance and usage literature explored hereafter. Our general conceptual model with underpinnings from CMUA is depicted in Figure 4-2 below:

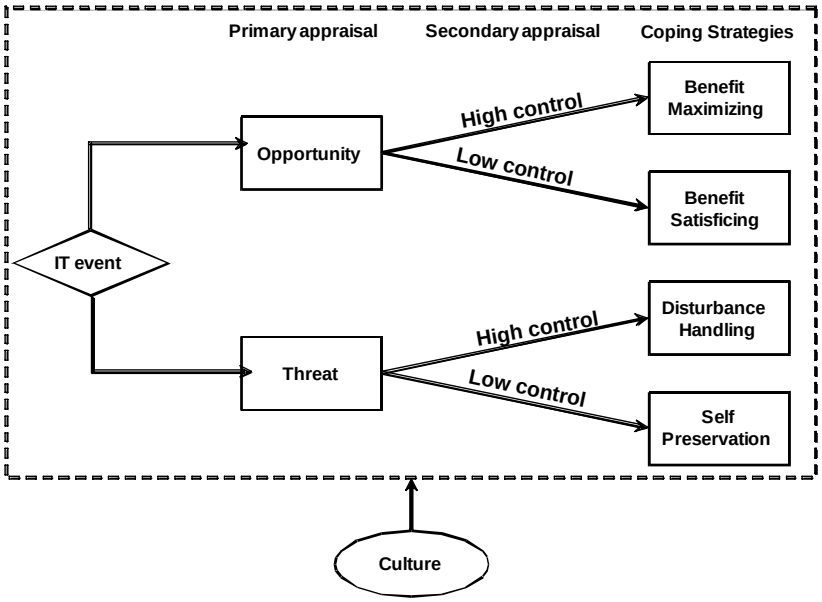


Figure 4-2. Research model (adapted from Beaudry and Pinsonneault 2005)

Strengths of CMUA with respect to limitations in the traditional system usage literature are presented in Table 4-1 below.

Table 4.1. The Value of Conceptualizing User Adaptation as a Coping Process

Concern	Response
Voluntary vs Mandatory Usage Context	▪ CMUA focuses on contextual and motivational contingencies with respect to system interactions. ▪ Envisages agency behaviors. ▪ Suitable for both mandatory and voluntary usage contexts.
Impediments to System Usage	▪ CMUA acknowledges the fact that impediments can affect user interaction with IS. ▪ The level of control over the situation is explicitly posed as a key determinant of user interactions with an IS. ▪ Envisages more complex user behaviors positing two appraisals of contextual and personal determinants of adaptation to IS.
Technology Disruptiveness	▪ CMUA envisages different levels of disruptions induced by the technology. ▪ Technology type and context of implementation can be appraised.
The Black Box of User Strategies of Adaptation	▪ CMUA takes into account the adaptive process that occurs between usage behaviors and their determinants. ▪ Offers a broader view of system user interactions with IS.

With respect to voluntary versus mandatory usage, CMUA permits us to envisage agency in adaptation to both mandatory and voluntary usage in focusing on adaptation and taking into account threats, opportunity, and control appraisal.

With respect to system impediments, CMUA takes into account the fact that people may not have control over the situation, which can prevent them from using a system as earlier stated by Bagozzi et al. (1998). Control over the situation is specifically taken into account. It is conceptualized by Beaudry and Pinsonneault (2005) as control over work, self, and the technology. Thus, CMUA envisages more complex behaviors occurring in more complex situations, thus permitting us to conceptualize richer models of user behaviors with respect to novel IT implementations.

With respect to technology disruptiveness, the CMUA analyzes perceptions of technology "events" in terms of threats and opportunities, and perceptions of control that are available in different strategies of adaptation. Because more complex technologies and context cannot be easily taken into account by traditional models of system usage, the CMUA is, we believe, particularly adept in addressing the issue of disruptive technologies and complex implementations.

With respect to the black box of user strategy of adaptation, CMUA specifically takes into account user appraisal of threats or opportunities, as they are experienced during IT implementations. It also envisages strategies of adaptation corresponding to major responses to IT implementation found in the IS literature. Furthermore, the agency framing of CMUA pushes the researcher to go beyond a view of users focusing on the features of the technology. Hence it favors insights into more complex user reactions to IS. CMUA thus offers avenues for opening up the black box of user adaptation strategies. Conceptualizing user coping efforts as adaptation during IS implementation appears to be particularly relevant in dealing with those concerns.

The key characteristics of CMUA and of Espoused Cultural Values used in this study are expanded later.

APPRAISAL PROCESS. A key concept in CMUA is appraisal of the situation. Lazarus and Folkman (1984) define cognitive appraisal as "the process of categorizing an encounter, and its various facets, with respect to its significance for well-being" (p. 31). Some researchers define appraisal as multiple interacting components and processes (Bagozzi et al. 1998). For example, Bagozzi et al. (1992a) suggest that three interacting appraisal processes are carried out after intentions of pursuing a goal are formed (Bagozzi et al. 1992a, p. 474).

By way of contrast, in CMUA appraisal is a two stage sequential process: the primary and secondary appraisal. The *primary appraisal* results in either threat perceptions or opportunity perceptions. In other words, primary appraisal leads to an interpretation as to whether there are stakes let out in a stressful encounter for the individual (Folkman et al. 1986, p. 994). In other words, it reflects how risky an individual perceives the situation to be (Lazarus et al. 1984; Tomaka et al. 1993). *Secondary appraisal* refers to the evaluation of what the individual can do in order to prevent negative outcomes or to increase benefits from

employing the system (Beaudry et al. 2005; Folkman et al. 1986). Various coping options are evaluated in secondary appraisal (Lazarus et al. 1984; Tomaka et al. 1993). In CMUA, secondary appraisal is defined as an evaluation of the control an individual has over the situation. Beaudry and Pinsonneault (2005) articulate three dimensions of control: (1) the control over the work, (2) control over self, and (3) control over the technology.

PRIMARY APPRAISAL: PERCEIVED THREATS AND OPPORTUNITIES. The first process in CMUA is thus that of primary appraisal. CMUA posits that threat and opportunity perceptions result from this primary appraisal of a disruptive IT event (Beaudry et al. 2005). Threats and opportunities have been studied at varying ways and levels of analysis. IS research at an individual level has often linked threat and opportunity to resistance to change (Lapointe et al. 2005; Martinko et al. 1996). However, despite the variety of the approaches in the literature, there is some consensus on how threat and opportunity should be defined. Jackson and Dutton (Jackson et al. 1988) suggest, for example, that threat usually connotes the negative impression of loss of control without gain.

Other authors have also contributed to this consensus. Lapointe and Rivard (2005) believe that perceived threats are a major motive for resistance to change. Users first appraise the features of the technology via initial conditions, and then evaluate the potential consequence of the technology being implemented (Lapointe et al. 2005). These researchers also showed that in some cases, the greater the perceived threat, the more aggressive the subsequent behavior of individuals resisting change. They then conceptualize a model of resistance positing that "resistance behaviors occur following perceived threats that result from the interaction between initial conditions and a given object" (Lapointe et al. 2005, p. 482). They go on to argue that group-level resistance to IT change is conveyed through an aggregation of individuals' resistance. As a consequence, it is especially important to understand individual

adaptation to IT.

Conversely, opportunity has a positive connotation, of gain with high levels of control. In similar conceptualizations, other researchers bring forward two fundamental aspects of threats and opportunities, such as loss or gain of control or resources (George et al. 2006). Individual characteristics can also significantly influence the perceptions of threats and opportunities (Beaudry et al. 2005; Jackson et al. 1988). For example, cognitive appraisal styles (Lazarus 1991; Skinner et al. 2002) play a role in the way an individual will appraise a situation. Skinner and Brewer (2002) assert that individuals with "challenge" appraisal styles are more inclined to cope effectively with a stressful situation than individuals with "threat" appraisal styles. Other beliefs such as trust or risk beliefs (Malhotra et al. 2004), self-competency beliefs (Krueger et al. 1994) can influence the perceptions of threat and opportunity and subsequently user intentions toward the technology and adaptation behaviors.

SECONDARY APPRAISAL: CONTROL OVER THE SITUATION. Following threat and opportunity assessment is a secondary appraisal. This is an evaluation the user makes about his/her personal resources. In this phase, CMUA posits that users evaluate the level of control they have over the situation. In CMUA, the level of user control shapes their perceptions about the disruptive IT event and influences their subsequent strategy of adaptation.

Control can also be analyzed with respect to the restrictions embedded in the technology itself. Limitations to an individual's control are embedded in the system itself, as when, for example, the system is very restrictive (Silver 1988). The notion of system restrictiveness refers to the limitation of the possibilities offered by a system to a subset of possibilities (Silver 1988). The restrictiveness of a system can thus limit user control. Systems such as ERPs, for example, allow limited customization to organizations (Davenport et al. 1989; Hammer 1990). In fact, ERP systems have embedded several standard organizational models

that can disrupt the legacy organization and culture (Saint-Léger 2004). Restrictiveness is also highly related to individual differences. Silver (1988) argues that individuals may rate the restrictiveness of the same system differently. The variation of system restrictiveness perceptions may be due to the ignorance of certain features of the system, the inability to use certain functionalities of the system or to reach certain goals with it (Silver 1988). Furthermore, even when a system is restrictive, users can still manipulate it to some extent by their inertia, or using the system in unexpected ways (Boudreau et al. 2005). In addition, restrictions with respects to the media used for performing a particular task may cause work to be more difficult and alter user satisfaction (Galegher et al. 1994).

The limitations of individual control over an IT and its consequences can also originate from the system user themselves. In this respect, control can be expressed as a form of perceived behavioral control which "reflects perceptions of internal and external constraints on behavior and encompasses self-efficacy, resource facilitating conditions, and technology facilitating conditions" (Venkatesh et al. 2003, p. 454). To some extent, thus, control can be linked to individual competencies that Thomas and Velthouse (1990, p. 672) defined as "the degree to which a person can perform task activities skillfully when he or she tries".

THE PROCESS OF COPING. Last, after the primary and secondary appraisal according to CMUA, users choose an adaptive strategy among several coping options. Lazarus and Folkman (1984) defined coping as "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (p. 141). According to these authors, this definition highlights four characteristics of coping:

(1) Coping is a process, rather than a trait. This highlights the dynamic, changing nature of coping. A process-oriented approach considers coping to be a response to the particular psychological and environmental demands involved by a stressful event, while the trait oriented approach considers the environment as meaningless while

coping is essentially the propriety of the person (Folkman et al. 1986, p. 992);

(2) Since coping involves effort, it differs from "automatized adaptive behaviors" that do not involve effort;

(3) Coping is defined as an "effort to manage" a situation and hence differs from its outcome; and (4) Coping is different from mastering the environment.

Coping takes on two main forms. The first is the "emotion-focused form". For Lazarus and Folkman (1984), it "consists of cognitive processes directed at lessening emotional distress and includes strategies such as avoidance, minimization, distancing, selective attention, positive comparisons, and wresting positive value from negative events"(p. 150). The second form of coping, the problem-focused form, is "directed at defining the problem, generating alternative solutions, weighting the alternatives in terms of their costs and benefits, choosing among them, and acting"(p. 152).

Based on this theory of coping, Beaudry and Pinsonneault (2005) developed CMUA, which stresses the possibility that individuals exercise strategies of adaptation during IT implementation. It shows that user behavior fundamentally depends on how s/he perceives the technology and how s/he subsequently makes efforts in order to manage the technological stressful event.

Differently, Larif and Lesobre (2004, p. 58) suggest that how social actors view a new IT being implemented influence their attitudes toward these IT. They identify four types of strategies that social actors enact in responding to new IT implementation as detailed below:

(4) Adhesion: Social actors have positive expectations about the new IT and have a positive attitude toward it. Social actors with such attitudes tend to involve significantly in the project.

(5) Restraint: While not opposed to the project, the actor tends to adopt a more prudent strategy in waiting for it to be operational before involving in its development.

(6) Distrust: Social actors have negative expectations about the project. The disruptions involved by the IT are perceived as threatening as it involves uncertainty and ambiguity.

(7) Reject: Expectations are clearly negative, and the actor feels he will lose some of the advantage to which he is entitled with legacy systems.

According to Larif and Lesobre (2004), two main factors can explain social actors attitudes with respect to disruptive IT implementation. The first factor is project uncertainty. In case of uncertainty about a project, actors will adopt a passive strategy of adaptation based on restraint or distrust. The second factor is user expectations about the technology. In that, Larif and Lesobre (2004) contend that for social actors to involve in the project, its risks must be lower than its expected advantages. In addition to these factors, the researchers identify other factors fostering adaptive strategies oriented toward acceptance, such as the implication of the sponsor, the actor, and the project team, as well as the perception of the business process reengineering approach.

Consistent with Lazarus and Folkman (1984), CMUA adopts a process-oriented rather than a trait-oriented approach to coping. Applying the theory of coping to the IS field, Beaudry and Pinsonneault (2005) identify four main strategies that individuals adopt in order to cope with changes created by IT. As summarized in Table 2 below, users adopt a "benefits maximizing" (BM) strategy when the technology is perceived to be providing opportunities and users believe they have a large amount of control. With an appraisal of opportunity embedded in system use and a perception of low control, users adopt a "benefits satisficing" (BS) strategy.

Two other and different strategies are adopted when the technology is thought to be a threat. When users believe themselves to have high control, they adopt a "disturbance handling" (DH) strategy. With low control perceptions, they espouse a "self preservation" (SP) strategy (Beaudry et al. 2005). Those coping strategies are summarized in Table 4-2 below.

Table 4.2. The Four Adaptation Strategies (Adapted from Beaudry and Pinsonneault 2005)

First Appraisal	Secondary Appraisal	Adaptation Strategy	Adaptation effort	Users' objective
Opportunity	High Control	Benefits Maximizing (BM)	Problem focused Maximal effort	To take full advantage of the opportunities of the IT To maximize personal benefits
	Low Control	Benefits Satisficing (BS)	Emotion and problem focused Minimal efforts	To satisfy oneself of the opportunity of the system
Threat	High Control	Disturbance handling (DH)	Problem focused and emotion focused	To restore emotional stability To minimize the negative consequences of the system
	Low Control	Self-preservation (SP)	Emotion focused	To restore emotional stability To reduce the tensions arising from the IT event

CULTURE AND CMUA. CMUA predicts which coping strategies users choose based on how they appraise the situation. However, it does not deal with whether or how national culture influences user coping strategies. Hofstede (2001, p. 9) defines culture as: "the collective programming of the mind that distinguishes the members of one group or category of people from another". Straub et al. (2002) suggest that culture is a multifaceted notion that can help to explain how individuals interact with IT (Gallivan and Srite 2005; Leidner and Kayworth 2006). Recent reviews of literature on culture and IT highlights the many definitions of culture and its numerous downstream effects (Gallivan and Srite 2005; Leidner and Kayworth 2006). Nevertheless, while many studies have suggested national culture significantly influences user interactions with and adoption of IT (e.g., Hwang 2005; Karahanna et al. 2005; Leidner et al. 2006; Srite et al. 2006; Straub et al. 2002), little is said specifically about its influence on user adaptation to IT.

Another issue that is frequently raised by researchers (Dorfman et al. 1988; Hwang 2005; McCoy et al. 2005; Srite et al. 2006) is that of the measurement of culture. The vast majority of positivist studies on culture and IT rely on Hofstede's (1980) work, an approach that is an intellectual tools to recognize the impacts of culture on behaviors in organizations (Gallivan et al. 2005). Hofstede (1980) classified countries based on the dominant attitudes of their

people toward the cultural values of masculinity-feminity, power distance, individualism-collectivism, and uncertainty avoidance. Researchers often compare countries based on these Hofstede indices.

While this approach has enjoyed considerable success, a number of researchers recently highlighted and discussed the conceptual difficulties inherent to it (Gallivan and Srite 2005; Hwang 2005; McCoy et al. 2005). At least three main concerns can be found in the Hofstede-based literature on culture and IT.

First, as Hofstede (1980) himself stressed, country scores are collective constructs that cannot be used at an individual level of analysis. There is, indeed, a sizable risk of ecological fallacy when inferences are made from a collective level construct deployed at an individual level (Morgeson et al. 1999). Consequently, many researchers now warn against the potential risks associated with using country scores for analyzing national culture differences among individuals (e.g. McCoy et al. 2005; Oyserman et al. 2002; Srite et al. 2006). Researchers have indeed argued that using such a framework for comparing individuals from different countries can be misleading.

Second, opponents of Hofstede and his followers criticize his view of culture as homogeneous when in fact it is not (Baskerville 2003; Gallivan and Srite 2005; Straub et al. 2002; Walsham 2002) and to reduce it to the "nation-state" concept while, in fact, several cultures can and do exist in the same country (Baskerville 2003; Bourdieu 1980; Myers and Tan 2002; Straub et al. 2002; Walsham 2002).

Third, researchers criticize the reliance on Hofstede (1980) indices because they are likely not to be accurate after more than 30 years since the data was collected for his seminal book (McCoy et al. 2005). Hofstede himself viewed his indices as temporally variant and subject to change. Examining the instruments Hofstede used in his study at IBM in early 80's, McCoy et

al. (2005) found marked differences between their own results and the original results of Hofstede. In addition, when further comparing Hofstede country scores to their own data collected with an individual-level measurement instrument based on an approach from Dorfman and Howell (1988), they also found important differences. This significant variance is evidence that Hofstede indices might no longer be accurate. This encouraged McCoy et al. (2005) to advocate individual-level, systematic measurement of culture rather than making cross country indexed comparisons.

These concerns received support from Oyserman (2002) who questioned the validity of Hofstede's conceptualization of individualism-collectivism dimension in a meta-analysis. Oyserman et al. (2002) suggest that studies based on this cultural construct were likely not to provide reliable conclusions and that, overall, the individualism-collectivism construct is problematic. While the researchers did not examine other cultural dimensions, these results are sufficient to invoke cautious uses and interpretations from all cultural indices of Hofstede.

To make the situation even more ambiguous, this critique has been challenged by other researchers. These researchers show that country indices are still accurate. Challenging the meta-analysis of Oyserman et al. (2002), Schimmack et al. (2005) argue that the individualism-collectivism construct is still viable (Schimmack et al. 2005). In fact, The Oyserman meta-analysis did not correct for attenuation as recommended by Hunter and Schmidt (1990) and this likely accounts for the differences they found with the Hofstede scores. The researchers thus tend to demonstrate that Hofstede indices criticisms are misleading and refute most of them. They instead suggest that the identified lack of convergence between the two approaches of culture is based on differences in statistical analysis:

> We propose that reliance on corrected or uncorrected scores is the most plausible explanation for the lack of convergence between the two approaches of measuring

> individualism and collectivism, namely applying Hofstede and measuring individualism (p. 21).

Furthermore, problems such as acquiescence response style according to Schimmack et al. (2005) can add bias to responses across cultures. They conclude that "individualism is a reliable and valid dimension of cultural differences" (Schimmack et al. 2005, p. 30).

While the researchers have directly challenged the individualism-collectivism (IC) dimension, it is important to note that this kind of measurement issue is poorly discussed in IS research and might require further study of all the cultural dimensions identified by Hofstede (1980).

The level of analysis issue, however, was still not solved by Schimmack et al. (2005). Research on culture in organizational settings is thus inconclusive with respect to the validity and appropriateness of Hofstede indices. For this reason, it is necessary to find alternative ways for measuring culture at an individual level.

ESPOUSED CULTURAL VALUES. One way to deal with these difficulties besetting the Hofstede indices is to study how espoused cultural values influence user adaptation to IT. In doing so, we examine individual differences in user interaction with IT (Karahanna et al. 2002; Zmud 1979). The espoused cultural values approach suggested by Srite and Karahanna (2006) consists of analyzing culture at an individual level, through the concept of 'value'. As stated by Hofstede (2001, p. 15): "In studying 'values,' we compare individuals; in studying 'culture,' we compare societies". Thus, espoused cultural values refer to the degree to which an individual adheres to specific values (Srite et al. 2006).

Following Straub et al. (2002), Srite and Karahanna (2006) introduce the term "espoused cultural values" in order to take into account how individuals may identify with cultural values to different degrees. They utilize Hofstede's (1980) dimensions of culture but rather than comparing groups of individuals from two or more countries — thus comparing societies

on a nation-state basis — they analyze the proximity of individuals from several countries to the cultural dimensions being highlighted. In order to do so, they employ, in part, an instrument by Dorfman and Howell (1988).

Following this, Srite and Karahanna (2006) examine the influence of espoused national cultural values on antecedents of behavioral intention to use IT. Such an approach was previously adopted by Hwang (2005) in modeling the role of uncertainty-avoidance (UA) on IS use, following calls for measuring culture at an individual level (e.g. McCoy et al. 2005). Espoused national cultural values are thus the latest methodological innovation in exploring culture and IT and, for this reason, we employ the EUA and individualism-collectivism (IC) metrics developed by Srite and Karahanna (2006). Figure 4-3 illustrates the shift from a nation-state to a cultural values approach.

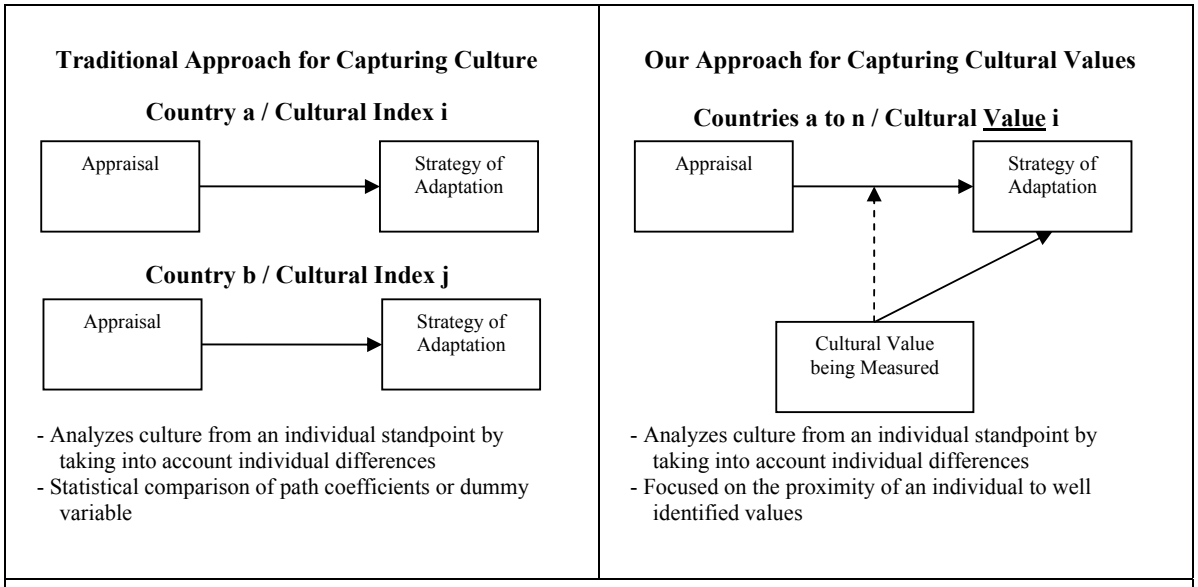


Figure 4-3. The Nation-State versus Individual Cultural Values Approach of Culture

Values were yet recognized by Lazarus and Folkman (1984) as being individual characteristics explaining differences in behaviors under comparable conditions. But while the Theory of Coping is nearly silent about the kind of influence cultural values have on user coping strategies, they do suggest that values are likely to influence an individual's cognitive

appraisal style (Lazarus et al. 1984):

> "[such styles] reflect[ing] the unique and changing relationship taking place between a person with certain distinctive characteristics (values, commitments, styles of perceiving and thinking) and an environment whose characteristics must be predicted and interpreted" (p. 24).

Therefore, because values can influence cognitive appraisal style, different cultural background and values can invoke different coping strategies in response to disruptive IT implementations.

Coping can be understood as an emotional response to disruptive situations. Some researchers suggest that studies examining emotions in cross-cultural settings have hardly found any impact from culture (Tsai et al. 2006). According to Tsai et al.(2006), these studies tend to show that emotions remain stable and similar across cultures. Contrariwise, others suggest that culture has a marked influence on emotions (Kitayama et al. 2000). But as it turns out, few of these studies measured the cultural variables involved in the analyses (Tsai et al. 2006). Culture was in fact comparable to nation-state, which is, as earlier demonstrated, beginning to raise concerns about validity. Analyzing espoused cultural values, hence, is an appropriate way to avoid such problems

Therefore, because of the power of espoused cultural values as a way to more accurately measure culture (Srite et al. 2006), we investigate the influence of two such values on user coping strategies: espoused uncertainty avoidance (UA) and espoused individualism-collectivism (IC). We believe these two dimensions are the most consistent with the goals of the present study.

The first of these is IC, acknowledged to be one of the most studied dimensions of culture (Oyserman et al. 2002; Schimmack et al. 2005). Because of the nature of individual differences implied by this value in terms of attitudes in response to challenging situations,

we believe that espousing such a value can result in marked differences among individuals. Persons who hold individualistic cultural values tend to act rationally by pursuing their own interests (Hofstede 2001). Put another way, individualistic persons are rational agents. Conversely, persons who espouse collectivistic cultural values attribute higher worth to their belonging to a group than to their individual desires. Persons with individualistic values give more importance to their own needs and interests, and persons with collectivistic values will tend to emphasize the interests and needs of the group (Srite et al. 2006). As we will see shortly in hypothesis development, we believe these distinctions between individualist and collectivistic values will result in marked differences in terms preferences for problem- or emotion-focused coping strategies.

As with IC, EUA is studied very frequently in IS research. Researchers have, in fact, related uncertainty avoidance to threat and opportunity before (Barr et al. 2004). Since we are studying user coping strategies in the context of either environmental threat or opportunity, we believe this dimension is particularly appropriate for analyzing differences in espoused cultural values.

What are the characteristics of UA? Persons with high EUA will tend to prefer non ambiguous situations. For Hofstede (2001, p. 149), "people in such cultures look for structure in their organizations, institutions, and relationships, which makes events clearly interpretable and predictable". Therefore EUA values refer to the level of risk and ambiguity that is accepted by an individual (Srite et al. 2006). Table 4-3 below gives the definitions of espoused uncertainty avoidance and espoused individualism-collectivism as provided by Srite and Karahanna (2006).

Table 4.3. Summary of Espoused Cultural Values

Espoused Cultural Value	Definition	Authors
Espoused uncertainty avoidance (EUA)	"Uncertainty avoidance is the level of risk accepted by the individual. This dimension examines the extent to which one feels threatened by ambiguous situations."	Srite and Karahanna. (2006, p. 682)
Espoused individualism-collectivism (EIC)	"Degree to which the individual emphasizes his/her own needs as opposed to the group needs and prefer to act as an individual rather than as a member of a group."	Srite and Karahanna (2006, p. 682)

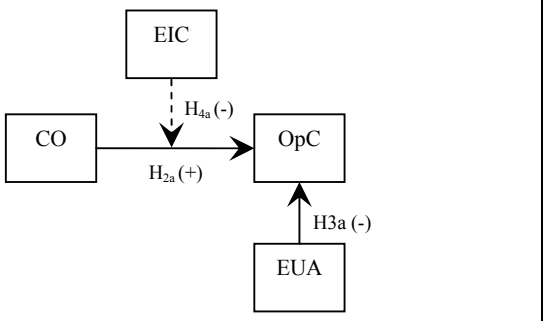
4.4. Model and Hypothesis

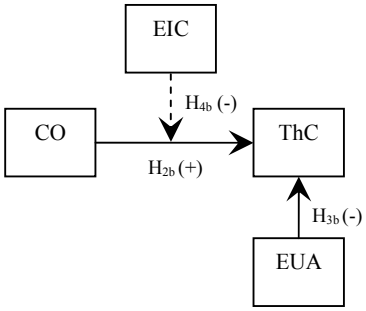
4.4.1. User Coping Strategies of Adaptation

Based on a qualitative study with a limited number of managers, Beaudry and Pinsonneault (2005) identify four main user strategies of adaptation. These four strategies are summarized in Table 1 and Figure 1 (shown above). Consistent with the strategic characteristics emphasized by Beaudry and Pinsonneault (2005), our aim is to develop and validate measures and to test them using the positivist paradigm. Our first hypothesis basically posits the distinctness of these strategies.

H_1: The four user strategies of adaptation in CMUA are empirically distinct from one other.

A way to test for the hypotheses in CMUA is to conceptualize user strategies of adaptation in terms of preference of one strategy over the other. We label user coping strategy choice under opportunity—OpChoice (OpC), and user strategies under threats—ThChoice (ThC). Hypotheses are depicted in Figure 4-4 below.





OpC = OpChoice, ThC = ThChoice, EIC = Espoused Individualism-Collectivism, EUA = Espoused Uncertainty Avoidance, CO = Control over the situation

Figure 4-4. Summary of Hypotheses

Those hypotheses are detailed next.

4.4.2. Primary and Secondary Appraisal

OPPORTUNITY APPRAISAL. The primary appraisal is that of threats and opportunities. Opportunities such as improved job performance (Beaudry et al. 2005; Nelson et al. 1996) and professional reputation can be conveyed by IT to users when technology use facilitates users demonstrating their competencies (McLure Wasko et al. 2005; Vaast et al. 2005). Vaast et al. (2005) show that users find an opportunity to have their competences made more visible through the system, they may expect to gain in professional reputation.

IT can provide other kinds of opportunities like increased autonomy and freedom (Beaudry et al. 2005; Crozier et al. 1977; Jackson et al. 1988), beliefs of high self-competences, and the possibility of increased control over uncertainty (Crozier et al. 1977). Users may also find that sharing presents an opportunity when, for example, they expect reciprocity from others (Gee-Woo Bock et al. 2005) for a win-win scenario. Therefore, when they perceive that the technology offers a potential for opportunity, system users are likely to adopt strategies focused on the benefits they can obtain by using that technology. Isaac et al. (2006b) suggest

field workers appropriate IT for the advantages it provided them. These researchers identified status symbols, self-worth, and prestige as relevant factors influencing mobile technology appropriation. They found workers were using these technologies for the advantages it provided in their work, but also for the capacity of these IT to satisfy private goals.

As a result of a secondary appraisal of the IT *event*, users feel they can control the consequences of the system, and when this occurs, they are more likely to have positive intentions toward it (Crozier et al. 1977; Jackson et al. 1988; Vaast et al. 2005; Venkatesh et al. 2003). The fact is that if they believe they can perform their tasks better with help of the system and perceive they have much control over the situation, they are likely to use the IT. When the system is less restrictive and allows multiple features up to the discretion of users, those users can find it controllable, more profitable, and will want to maximize its use. Therefore, when the situation is appraised as offering many opportunities and users feel they have a relatively high level of control over the situation, they are likely to adopt a "benefits maximizing" strategy of adaptation (Beaudry et al. 2005) .

Conversely, if users believe they have low control over the situation, albeit the situation still provides opportunities, Beaudry and Pinsonneault (2005) argue that they are likely to make limited efforts to adapt to the technology. Under such conditions users are willing to benefit from the situation without making many efforts toward that goal, since they have too little control over the situation. They may, for example, feel they have insufficient competencies (Thomas et al. 1990) to adapt to the changes occurring or to master the features of the technology (Venkatesh et al. 2003). As a consequence, instead of maximizing their strategy, which can be difficult when they only have little control over the situation (Beaudry et al. 2005), they are more likely to try to choose a passive coping strategy rather than trying to achieve the best solution. Therefore, on a secondary appraisal, low levels of control over the

situation even when the situation offers opportunities will result in a "benefits satisficing" strategy of adaptation (Beaudry et al. 2005).

> **H_{2a}**: When users appraise the IT event as an opportunity, the more control they have over the situation, the more they will adopt a BM coping strategy of adaptation rather than a BS coping strategy of adaptation.

THREAT APPRAISAL. When users appraise the situation as having many threats, their coping strategies differ as compared with a situation with many opportunities. Because disruptive technologies result in an overhauling of an organization (Davenport et al. 1989; Hammer 1990) and involve radical transformation (Lyytinen et al. 2003; Sherif et al. 2006), they can be threatening to individuals. With the implementation of a disruptive technology, several factors can render a situation threatening for an individual. These include: potentially negative impacts on work and performance (Beaudry et al. 2005; Lapointe et al. 2005; Martinko et al. 1996), uncertainty, and ambiguity (Crozier and Friedberg 1977; George et al. 2006; Jackson and Dutton 1988), but also trust and risks beliefs (Malhotra et al. 2004), beliefs about self competencies (Jackson and Dutton 1988; Krueger and Dickson 1994), and beliefs about user influence on control and resources (Chattopadhyay et al. 2001; Crozier and Friedberg 1977; George et al. 2006; Jackson and Dutton 1988; Martinko et al. 1996). Any of these can contribute to greater threat perceptions by users.

The large body of literature on user resistance to IT change suggests that when a technology is perceived as a threat, users may avoid using it in order to preserve themselves from the potential negative consequences of that threat (Beaudry et al. 2005; Lapointe et al. 2005; Martinko et al. 1996). Therefore, when users perceive the technology as a threat, CMUA envisages a greater disposition to strategies such as "disturbance handling" and "self-preservation" strategies (Beaudry et al. 2005).

Threat perceptions occur with user first appraisal of the disruptive IT situation. When users

feel they have high control over the situation, their strategies of adaptation are problem- and emotion-focused (Beaudry et al. 2005). Indeed, even if they perceive the situation is threatening, they may still be confident that they have the control necessary to manage the situation. Therefore, they are likely to improve their capacity to work with the system or to modify its features. Beaudry and Pinsonneault (2005, p. 502) identified such behaviors as looking for training, changing the features of the technology, or adapting work procedures as behaviors reflecting a disturbance handling strategy. Consequently, when system users appraise the situation as threatening, but believe they have control over the situation, they will adopt a "disturbance handling" strategy of adaptation (Beaudry et al. 2005). An IT, however, might not univocally offer opportunities or involve threats to employees. For example, in Isaac et al. (2006b) mobile technologies were primarily implemented to increase the control over fieldworkers. Though, with an increased control and lower autonomy, fieldworkers were conscious that mobile IT not only offered advantages, but were also threatening for them. The researchers however highlight that the fieldworkers considered the advantages of the IT more important than their potential negative consequences on their autonomy. Thus, mobile IT were found having more opportunities than threats, which induced user appropriation of such technologies.

As just noted, in a threat condition with user high control, users will adopt a disturbance handling strategy. When appraising low control over the situation, users are more prudent in their adaptation to the technology. A more restrictive system can diminish the discretion users can have over the system and subsequently their control over the system (Silver 1988). Also, when the situation holds threats and individuals do not feel they are sufficiently competent or skilled in use of the technology, they are likely to engage in a minimal adaptation effort (Beaudry et al. 2005). As a consequence, coping efforts will be emotion-focused, since the users will be likely to minimize the negative consequences the system has on them, or else

they will simply try to avoid using it if possible for them to (Beaudry et al. 2005). Therefore, when users appraise the technology as holding many threats and when they feel they have little control over the situation, they are predicted to adopt a "self preservation strategy" (Beaudry et al. 2005).

> **H_{2b}**: When users appraise the IT event as a threat, the more control they have over the situation, the more they will adopt a DH coping strategy of adaptation rather than a SP coping strategy of adaptation.

4.4.3. Espoused Cultural Values

These coping strategies to disruptive IT employed by system users as detailed above are likely not to be invariant depending on user cultural values. Research on IS and culture has been particularly prolific. Overall, this tradition sets forth the thesis that national culture has an important impact on user behaviors when they are using IT (Gallivan et al. 2005; Straub et al. 2002). We hypothesize that espoused uncertainty avoidance and individualism-collectivism values (Srite et al. 2006) have significant impacts on the above relationships.

ESPOUSED UNCERTAINTY AVOIDANCE (EUA). As noted above, individuals whose espoused cultural value is high EUA feel threatened by ambiguous situations and instead place a heavy value on order and structure (Hofstede 2001). For example, Srite and Karahanna (2006) found that the relationship between subjective norm and intention to use was stronger for persons with higher levels of uncertainty avoidance than for persons with lower levels.

Uncertainty is also one of the major threats in ones' social environment (Crozier et al. 1977). Those who master uncertainty receive power, while, conversely, those who evolve in uncertain environment may feel threatened (Crozier et al. 1977). Consequently, individuals who fear uncertainty will, in response, tend to act in order to reduce uncertainty (Crozier et al. 1977). Reducing uncertainty can be obtained by resisting to change that involves ambiguity (Doney et al. 1998), or instead by adapting to change when change is seen as ineluctable

(Geletkanycz 1997). Therefore, because change is ineluctable in mandatory usage contexts, we believe uncertainty avoidant users will be more incline to adapt with a problem focused coping strategy.

Another differentiating factor of UA is the preference for standardization in work practices (Newburry et al. 2006). For example, Newbury and Yakova (2006) hypothesized that because individuals from high UA cultures were more inclined to value order, structure, and to act in accordance with social norms, they would prefer activity standardization across their organization. Specifically, BPR is often accompanied by process standardization (Hammer 1990) that high UA users would thus value more than low UA users. UA systems users are thus expected to act in accordance with the objectives of the system.

Another important difference between high UA and low UA people is with respect to risk taking. Indeed, Keil (2000) suggested that people from low UA cultures are likely to take more risky decisions about IS than people from high UA cultures. In their study, Veiga et al. (2001) suggest that people with high UA cultures are likely to be reluctant to learn from new IT that are likely to involve uncertainty and ambiguity. The researchers also suggest that it is likely to be harder to involve those users to system development.

Differently, Straub et al. (1997) related uncertainty avoidance to media choice, suggesting that, consistently with media richness theory (Daft et al. 1986), individuals tend to choose a media depending on its capacity to handle uncertainty or equivoque. Applied to coping adaptive strategies, we can thus expect that users who espouse high UA values will favor diminishing uncertainty in the course of their adaptation to the IT.

Finally, uncertainty avoidance has been related to ease of use in the context of ERP adoption. Applying the TAM for understanding ERP acceptance adoption in an empirical survey, Hwang (2005) showed that uncertainty avoidance value was positively related with ease of

use perception. Their rationale was that individual locus of control is related to ease of use and can be enhanced by ERP additional functionalities. They posited that the more uncertainty avoidant an individual is with low anxiety, the more that individual is likely to find the ERP system easy to use (Hwang 2005).

These results together suggest that high espoused UA users will actively adapt to disruptive IT than low espoused UA users. This finding was corroborated by Geletkanycz (1997) who found that managers from UA countries were less in favor of the status quo and were more open to change than managers from low UA cultures. Geletkanycz (1997) provides an interesting explanation of such a result:

> Namely, in an era of globalization and technological revolution, these executives seem to be attempting to reduce their uncertainty through a posture of adaptation. Rather than steadfastly adhere to earlier-effected policies – and cope with the risks and uncertainties a changing environment poses – executives socialized to uncertainty avoidance values seem to favor adjustment (p. 629).

Although the literature provides many indications about the influence of UA on system usage and adoption, overall, it provides scarce indications on how UA individuals adapt to disruptive IT in mandatory usage context. Applying the finding of Geletkanycz (1997) to IT, and consistent with Hwang (2005), we can expect UA people behave more in favor to IT, when change is seen as ineluctable. In addition, since, as discussed earlier, except for Hwang (2005) and Srite and Karahanna (2006), most research in IS analyze culture at the collective level, results from prior studies should be interpreted cautiously before making interpretations at the individual level of analysis (Morgeson et al. 1999).

Thus, in the context of coping with disruptive IT implementation, we believe high UA individuals will tend to emphasize the threats of a situation but also sense a high need for control. They will choose strategies of adaptation congruent with lower levels of ambiguity. More than those who cope better with uncertainty, they will tend to be problem-focused. This

means that they will strive to increase their control over the situation.

We thus posit individuals with high UA values will be more problem-focused than those who feel comfortable in ambiguous situations. Specifically, we believe the benefits satisficing and the self preservation strategies invoke ambiguity, and hence high UA individuals are likely to avoid these coping strategies. In fact, high UA individuals will adopt adaptive strategies that will reduce uncertainty. The result of the change process is uncertain when individuals feel they have no control over the situation. Thus, in such circumstances, high UA users will make efforts to put the situation under control. This implies that they will adopt more problem focused adaptive strategies than low UA individuals.

Also, the social norm that has been shown to motivate high UA individuals to use the system more than the low UA ones (Srite et al. 2006) is likely to motivate users to have problem focused coping strategies. Since managers usually expect the implemented system to be used efficiently by users, high UA individuals are likely to comply more with this expectation than low UA individuals. These results will hold even better in mandatory context in which users do not have the possibility to merely avoid using the system and have limited means to resist its implementation. Therefore, because UA individuals prefer non ambiguous situations, they are likely to prefer the benefits maximizing coping strategy over the benefits satisficing coping strategy.

> **H_{3a}:** In the case in which the technology offers many opportunities, individuals who espouse high UA national cultural values will tend to adopt a BM coping strategy of adaptation rather than a BS strategy of adaptation.

Similarly, we believe that when the situation has many threats, high UA users will prefer to adapt to the situation with a disturbance handling (DH) strategy rather than with a self-preservation (SP) coping strategy. The SP strategy is characterized by the restoration of emotional stability and avoidance of the problem. Instead of adapting to the situation, users

will avoid it, because the situation is very threatening, and user control over the situation is low. However, self preservation does not diminish future threats from the situation, thus increasing the uncertainty of the situation. Therefore, because UA individuals prefer non-ambiguous situations, we believe they will try handling the situation. In other words, they will be more likely to acquire new competencies and advantages from the system implementation. They will try to master new work procedures in order to diminish the uncertainty caused by the situation. This is consistent with the findings of Geletkanycz (1997) that uncertainty avoidant (UA) individuals adapt to the situation rather than maintain the status quo.

> **H_{3b}:** In the case in which the technology offers many threats, users who espouse high UA national cultural values will tend to adopt a DH coping strategy of adaptation rather than a SP coping strategy of adaptation.

ESPOUSED INDIVIDUALISM-COLLECTIVISM (IC). In contrast with UA, we posit that IC has a moderating effect on user coping strategies. Specifically, we believe how individuals will determine personal interest / group interest will depend upon an interaction between the level of control they have over the situation and their values. Persons with individualistic values tend to pursue their own interests, while persons with collectivistic values put forward the interest of the group (Hofstede 2001). Hofstede (2001) suggested that individuals with low individualistic values will give more credit to collective decisions, will have low commitment to the organization, and will consider organizational success to be the result of information sharing, open commitment, and political alliance (Hofstede 2001, p. 244).

Conversely, highly individualistic persons will give more credit to individual decisions and have a higher commitment to the organization. Moreover, they will refuse to share information, will not openly commit, and will avoid alliances (Hofstede 2001, p. 244). In a collectivistic culture, according to Hofstede (2001, p. 235), "the employee will act according to the interest of this in-group, which may not always coincide with his or her individual interest". Indeed, in computer mediated communications it has been shown that decisions of

the majority (vs. the individual) are more easily accepted in collectivistic cultures than in individualist ones (Tan et al. 1998).

Additionally, high collectivistic persons are said to comply more to norms, regulations and opinions of their group of reference than individualist ones (Srite et al. 2006). In contrast, highly individualistic persons put less emphasis on their social environment (Srite et al. 2006; Triandis 2004). They will also be more sensitive to their own resources in terms of control and will be more confident in their capability to adapt to the situation than high collectivistic individuals. For that, we can expect that highly individualistic persons will be more willing to engage in adaptive effort than highly collectivistic individuals. In contrast, highly collectivistic persons will tend to put first the collective interest and will deemphasize the role of control they personally have over the situation in determining their adaptive strategy.

Therefore, we can expect that the relation between control and the choice of a BM strategy will be stronger for people who espouse highly individualistic values than for people with who espouse highly collectivistic values. We therefore posit:

> **H_{4a}**: In the case in which the technology holds many opportunities, the higher the control they have over the situation, the less users who espouse more collectivistic national cultural values are likely to adopt a BM coping strategy of adaptation rather than a BS coping strategy of adaptation.

Similarly, when the system holds many threats, the relationship between control and user strategy of adaptation will be such that collectivistic individuals will put less emphasis on the control they have over the situation. Further, disruptive IT that involve negative consequences on employee are expected to be considered as even more dangerous as people espouse high collectivistic values.

Thus, we expect the relationship between control and user adaptive strategy will be such that high collectivistic system users will be more incline to adopt an SP coping strategy than high

individualist ones who will have more of a tendency to adopt a DH coping strategy. Consequently we posit:

> **H_{4b}**: In the case in which the technology holds many threats, the higher the control over the situation, the more users who espouse less collectivistic national cultural values are likely to adopt a DH coping strategy of adaptation rather than a SP coping strategy of adaptation.

In order to examine these hypotheses, we chose a quantitative approach, described next.

4.5. Research Design and Methods

In order to test our research model (Figure 4), we selected a 2x2 experimental design. Since the design assigned treatments randomly to subjects, it was a true experiment conducted in a laboratory setting.

The IT artifact chosen for the experimental scenario is an enterprise resource planning (ERP) IS, *SysControl*, which involves radical changes in the way management controllers perform their work. The system is, therefore, disruptive since the expected change can be considered to be both radical and pervasive (Lyytinen et al. 2003). For the purpose of this study, we adopt a repeated treatments experimental design with subjects having to assess a series of real world scenarios (Straub et al. 1998). Four hypothetical scenarios were posed to subjects and data were collected via experimental questionnaires. This approach appears to be particularly apt, given that the level of analysis of this study is the strategies adopted by users who are confronted with the imminent implementation of a disruptive IT. Consistent with Straub and Karahanna (1998, p. 164), we manipulated independent variables by changes in the wording of the scenarios.

4.5.1. Scenario

The scenario as elaborated deals with an ERP, which have been of high interest in IS research.

ERP systems can be considered to be disruptive technologies when they involve radical changes in the way individuals work together, and work processes are reconfigured (Lyytinen et al. 2003). Subjects were told that their company had implemented a new ERP system, *SysControl*, and that the system created radical changes in the way they would have to work with their collaborators. Consistent with the process approach of coping (Lazarus et al. 1984), threats and opportunities, as well as control were defined with respect to the psychological and environmental demands placed on the individual. In order to manipulate threat/opportunity as well as high and low controls conditions, we created four scenarios with different psychological and environmental situations.

4.5.2. Experimental Manipulations

The manipulations were embedded in the wording of the scenarios. Subjects were asked to role-play a financial controller in BestInsurance, Inc. and told that *SysControl* was expected to increase financial controller performance. First, common to both scenarios is a general description of the purpose of *SysControl* and of its context of implementation in BestInsurance, Inc. A second part is an assessment of the work context (threat/opportunity) and capabilities of the user (high control/low control) with respect to the system and the situation. Consistent with the literature on threat and opportunity perceptions (e.g., Chattopadhyay et al. 2001; Crozier et al. 1977; George et al. 2006; Jackson et al. 1988) and the Theory of Coping (Lazarus et al. 1984), the manipulations were phrased so that subjects clearly perceived threats or opportunities as well as whether they had a great deal of control or little control in responding to the threat/opportunity.

In the scenario focusing on opportunity, *SysControl* was said to offer many opportunities to controllers. Increased overall performance at work was expected from SysControl, consistent with the literature on ERPs (Davenport et al. 1989; Hammer 1990; Hammer et al. 1993).

On the other hand, in the scenario focusing on threats, it was stressed that the ERP could be used to replace controllers. Furthermore, controllers at BestInsurance, Inc. were defined in the scenarios as lower performers than those in rival companies. There should thus be some ambiguity about whether the system would be used to fire controllers. In addition, it was emphasized that SysControl would be unlikely to increase the efficiency of controllers, but rather contribute to errors and loss of data. It is presented as a bad quality ERP system, with unexpected undesirable consequences, in an organizational context which is not favorable to management controllers. Such characteristics have been identified in prior research as involving risks to the implementation of the ERP system (Bernard et al. 2004). In sum, SysControl was framed as a bad system, threatening and poorly-implemented, and the replacement for old, but non-threatening legacy systems. Overall, the scenarios focused on threats associated with the implementation of SysControl and described a stressful situation to which individuals would have to cope.

Similarly, control over the situation was manipulated. Aspects of control of CMUA (Beaudry et al. 2005) include control of work (Shaw et al. 1997a; Thomas et al. 1990), self, and technology (Beaudry et al. 2005; Venkatesh et al. 2003). In the scenario, the subjects shown that they either had high control on their work, self, and the technology simultaneously, or else low control. Control over their work included having sufficient autonomy at work and the capacity to modify tasks in response to the changing environment (Shaw et al. 1997a; Thomas et al. 1990). Control over the self refers to how well the individual could adapt to the situation. Finally, control over the technology deals with the degree of mastery the individual has over features and functionalities of *SysControl*, whether they were involved in the development of the system or not. To ensure that manipulations of control over the self and technology were effective, they were also checked against the metrics of perceived behavioral control (Venkatesh et al. 2003). Details on the scenarios are given in Appendix C.

4.5.3. Procedure

The scenarios were administered partly via a paper based questionnaire and partly via a web experiment. For the paper-based questionnaire version, subjects were given an experimental packet comprised of a consent form, the scenario and the questionnaires randomly assigned at the end of Business and Information Systems classes. For the web-based experiment, subject had to choose one scenario configuration randomly after they indicated their willingness to participate to the study. For research integrity purposes, but also to minimize common method bias, the anonymity of the subjects was guaranteed. In that circumstance, response anonymity can reduce subject apprehension (Podsakoff et al. 2003). Subjects were told that there were no right or wrong questions and that only their honest response was required (Podsakoff et al. 2003).

Once agreeing to participate, subjects had first to answer questions regarding their cultural values. Second they had to read the scenario preceded by a description of the general context of the situation. They were then randomly assigned two out of four scenarios, consistent with our true experimental design approach (Cook et al. 1979) and either two on threats or two on opportunities.

4.5.4. Measures and Pretest

The items in the questionnaires deal with the perception of the degrees of disruptiveness of the technology, the primary and secondary appraisals, and the coping strategies. Manipulation checks (Boudreau et al. 2001) were included in order to prove that the manipulation worked. Perception of technology disruptiveness (1 item) is a manipulation check assessed with one item straightforwardly asking to the subject how far the technology has modified current work practices. This measure is consistent with definitions of disruptive technologies that consider it to involve pervasive and radical changes (Lyytinen et al. 2003). Subjects indicated on a 7

point scale the degree to which they perceived the technology to be disruptive.

Primary appraisal in CMUA involves evaluating potential threats and opportunities due to the stressful event (Beaudry et al. 2005). Primary appraisal is a second manipulation check, assessed with a single item measure related to the level of threats and opportunities perceived in the situation. The subjects had to indicate on a 7 point scale how high were the stakes involved.

Secondary appraisal is the evaluation of the level of control users have over their work and the technology (Beaudry et al. 2005; Shaw et al. 1997a). Secondary appraisal, which has been manipulated, is checked with modified measures of perceived behavioral control from Venkatesh et al. (2003), reflecting the perceptions of the constraints on the behavior plus several new measures developed for the study. The subjects had to indicate on a 7 point Likert scale the level of control they perceived in the scenarios.

User coping strategies are the four strategies described in Table 1. Following Beaudry and Pinsonneault (2005), they are: benefits maximizing, benefits satisficing, disturbance handling, and self-preservation.. Items for user coping strategies of adaptation were developed consistent with the descriptions of Beaudry and Pinsonneault (2005).

Cultural values were measured through self-reports in a pretest questionnaire. Our approach is focused on the individual level of analysis (Dorfman and Howell 1988; Srite and Karahanna 2006; Straub et al. 2002). Specifically, in our questionnaire, we reproduced the metrics of espoused UA and espoused IC used by Srite and Karahanna (2006). These measures have been assessed with a 7 points scale indicating how far an individual espouses these values.

Content validity was examined via a literature review that helped to build our constructs and by four expert judges familiar with our domain of investigation(Boudreau et al. 2001). Since

item complexity and ambiguity can induce common methods bias, we have been cautious in creating questions as simple and neutral as possible (Podsakoff et al. 2003). Before performing the experiment with subjects in a French university, the questionnaire, elaborated in English, has been translated into French then translated back in English. The translated instrument appeared to be consistent with the original measures, which ensure that the two versions of the instrument are similar. Table 4-4 provides the detail of the constructs and of their theoretical rationale:

Table 4.4. Summary of Constructs

Construct	# items	Source/dimension
Technology disruptiveness	1	Manipulation check
Threat/opportunity (manipulated)	1	Manipulation check
Perceived Control (CO) (manipulated)	6	Partly adapted from Venkatesh, Morris et al. (2003) and Shaw and Barrett-Powel (1997); Manipulation check
Benefits maximizing (BM)	5	Developed from Beaudry and Pinsonneault (2005)'s conceptualization
Benefits Satisficing (BS)	4	Developed from Beaudry and Pinsonneault (2005)'s conceptualization
Disturbance Handling (DH)	4	Developed from Beaudry and Pinsonneault (2005)'s conceptualization
Self-Preservation (SP)	4	Developed from Beaudry and Pinsonneault (2005)'s conceptualization
Espoused Uncertainty Avoidance (EUA)	3	Adapted from Srite and Karahanna (2006)
Espoused Individualism-Collectivism (EIC)	3	Adapted from Srite and Karahanna (2006)

4.5.5. Sampling

Culturally diverse people were sought to participate to the study. We wanted to be sure to have a large enough sample so as to draw valid conclusions (Baroudi et al. 1989). The significance criterion associated with the probability of committing Type I error is α. Coefficient β represents the probability of committing Type II error of non-identification of relations that do exist. Consistent with the generally accepted conventions (Baroudi et al. 1989) we adopted a level of significance of $\alpha=0.05$ and $\beta=0.20$, i.e., power = $1- \beta =0.80$. Given that there are four groups, a minimum cell size was set at 20. Therefore a minimum number of $4*20=80$ subjects overall was required for this study. In total, 209 students from

diverse nationalities were subjects in the experiment. Cell and sample size are thus well above the minimum necessary with respect to power.

The paper-based experiment took place at the end of three IS, Accounting, and General management courses. Two paper-based questionnaires were unusable. The response rate for the web-experiment was 60%. In order to increase variation among individuals, participants were from a French public university and a southeastern public university in the US. Students from a total of 24 nationalities participated.

This approach is different from multi-group comparisons in that culture was evaluated at an individual level. Nonetheless, Hofstede (2001) found that among surveyed countries, France ranks 10-15 on uncertainty avoidance with an index of 86 while the USA rank 43 with an index of 46. With respect to individualism, the USA rank first with an index value of 91, and France rank 10-15 with a value of 71. What this means is that conducting the experimentation in two contrasting countries on those dimensions is likely to add variance among respondents.

With respect to respondents characteristics, 50% were male, 50% female and their average age was 23.17 (standard deviation = 3.63 years). On average, subjects spent 4.24 years studying at a university level (standard deviation = 0.87) and worked 2.72 years (standard deviation = 3.88). Most subjects had professional experience or were currently working in apprenticeship. Of the participants, 83% were undergraduates. They reported using a computer 32 hours a week (standard deviation = 18.29 hours) with a reasonable level of computer efficacy (mean on the 7 points scale = 4.93, standard deviation = 1.22).

4.5.6. Manipulation and Control Checks

Prior to assessing coping strategies, subjects had to answer manipulation checks. Manipulation checks for threats and opportunities and for technology disruptiveness were

based on one question asking for the amount of threat or opportunity or the amount of technology disruptiveness subjects perceived there were in the scenario (see appendix A). Means and T-tests between groups in Table 3-5 show that threat/opportunity as well as control significantly differed among groups, providing evidence that the manipulation worked. On average, as anticipated, subjects reported that the situation had opportunity (mean = 5.21, S.D. = 1.44 for the scenario with opportunities) and threats (mean = 3.24, S.D. = 1.71 for the scenario with threats).

As shown in Table 4-5 below, subjects also perceived the technology as disruptive (mean=5.08, S.D. = 1.39). Technology disruptiveness was assessed right after the reading of the first part of the scenario dealing on general background on BestInsurance, Inc.

Table 4.5. Manipulation Checks

Scenario	N	Mean	S.D.[1]	S.E.[2]	F-Test	T-Test
IS Disruptiveness						
Technology Disruptiveness	207	5.08	1.39	.10	-	-
Threats and Opportunity Assessments						
Opportunity Condition	207	5.21	1.44	.10	-	-
Threat Condition	207	3.24	1.71	.12	-	-
Means for Control Reports						
Opportunity / Control	96	5.44	0.88	.10	13.66***	9.61***[3]
Opportunity / No Control	111	3.99	1.21	.12		9.83***[4]
Threat / Control	107	4.92	1.07	.11	6.88***	9.42***[3]
Threat / No Control	100	3.34	1.32	.12		9.49***[4]

[1]S.D. = Standard Deviation; [2]S.E. Standard Error, [3]Equal Variance Assumed, [4]Equal Variance not Assumed
* p <.05, * p <.01, *** p <.001

Similarly, subjects reported whether they had control over the situation (mean=4.92 for the scenario with threats) or not (3.34 for the scenario with threats) when expected. As well, when the situation had opportunities and subjects had control, they reported having control (mean = 5.44, S.D. = 0.88 or not (mean=3.99, S.D. 1.21). However, while the reports of control significantly differ for the scenario with opportunities (T-Test = 8.35), the report mean for control is 4.07 – thus undecided about control – when subjects are not provided with control.

Overall, the analysis of manipulation checks showed that the manipulation worked. Next is the analysis of the measurement properties of our instrument and the analysis of hypotheses.

4.6. Validity and Reliabiliy

After assessing that the experimental manipulation worked on subject, we analyzed the measurement properties and the structural paths in our models. Partial Least Squares (PLS) was used to perform the analyses. First, we assess the measurement properties of our instrument. Then, we test the hypotheses regarding the choice of user strategies of adaptation, and the influence of espoused UA and IC.

4.6.1. Measurement Validation

The first step for the assessment of measurement properties was to test reliability. Since the constructs of our model are reflective, Cronbach's alphas are appropriate for testing reliability (Gefen et al. 2000). Because IC1 and IC2 significantly decreased the overall construct reliability of Espoused IC construct, we dropped these items. This did not affect the content of the constructs because reflective items are interchangeable (Jarvis et al. 2003). As shown in Table 3-6 below, Cronbach's alphas range from .73 to .84, which is within the range of commonly accepted values.

Second, we tested convergent and discriminant validity (Boudreau et al. 2001). For that purpose, we performed a Principal Component Analysis (PCA) with each pair of coping strategies of adaptation constructs plus espoused cultural values. The PCA led us to delete UA4 due to poor psychometric properties. Any item that loaded at a level above .40 (values in bold in Table 3-6) on an unintended construct was a candidate for deletion because it is a threat to discriminant validity (Gefen et al. 2000). At this point, all items loaded cleanly on their intended construct. Other statistics were checked, including the level of variance

explained and the Kaiser Meyer Olkin (KMO) measure of sampling adequacy. The results of the PCAs are shown in Table 4-6 below.

Table 4.6. Principal Component Analyses[1]

BM and BS Strategies					DH and SP Strategies				
Item	BM	BS	EUA	EIC	Item	DH	SP	EUA	EIC
BM2	**.85**	-.13	.09	.06	DH2	**.85**	-.27	-.04	-.04
BM3	**.83**	-.14	.05	.06	DH3	**.84**	-.32	.03	.01
BM1	**.79**	-.01	.18	.04	DH1	**.84**	-.19	.01	-.01
BM4	**.70**	-.16	.12	.05	DH4	**.73**	-.31	.09	-.05
BM5	**.63**	-.26	.14	.01	SP4	-.39	**.83**	-.08	.05
BS4	-.23	**.77**	-.09	-.07	SP3	-.34	**.81**	-.13	.02
BS5	-.29	**.75**	-.07	-.05	SP2	-.31	**.78**	.02	-.02
BS2	-.10	**.72**	-.13	.04	UA2	.03	-.10	**.84**	.12
BS1	-.01	**.66**	.18	.07	UA1	.08	.01	**.83**	.08
UA2	.05	-.07	**.85**	.12	UA3	-.04	-.06	**.79**	.06
UA1	.21	-.09	**.79**	.09	IN4	.06	.14	.16	**.84**
UA3	.21	.07	**.76**	.05	IN3	-.01	-.07	-.06	**.80**
IN4	.02	.00	.15	**.85**	IN5	-.11	-.01	.19	**.73**
IN3	.15	.06	-.09	**.79**					
IN5	-.01	-.06	.19	**.74**					
V.E.	28.38%	14.60%	10.51%	9.67%	V.E.	34.50%	18.82%	11.80%	7.02%
KMO Measure of Sampling Adequacy = 0.78					KMO Measure of Sampling Adequacy = 0.79				
Total V.E. = 63.16 %					Total V.E.= 72.15 %				
Cronbach's Alphas: BM=.844, BS=.728, DH=.886, SP=.849, EUA=.767, EIC=.713									

[1]BS1, EIC1, EIC2 and EUA4 have been excluded from analyses following an iterative process in order to refine the instrument.

[2]V.E. = Variance Extracted

Convergent validity can be assessed when the items are significantly related with their intended constructs. All of the items in the PCA load at least .63 on their intended construct, which shows appropriate convergent validity. Since items load more highly on their intended construct than on any other construct (Boudreau et al. 2001), discriminant validity was reasonable. Furthermore, since no item loadings exceeded .40 on constructs other than those on which they are intended to load, we can therefore conclude that the instrument has appropriate discriminant validity (Straub et al. 2004).

4.6.2. Scales for OpChoice and ThChoice

After the test of measurement properties, we had to build scales to measure user preference for one coping strategy of adaptation over another. We elaborated continuous scales

representing user preferred coping strategy over the other. Since subjects had the possibility of stating their perceptions for two strategies for each scenario, we needed a scale that would predict which one of the two strategies subjects would be more likely to choose. The scales were built by taking the means of items for each strategy constructs. Then we calculated the difference between one strategy and the other such as:

Mean (BM_i , …,BM_n) – Mean (BS_j,…,BS_z) > 0 ↔the user prefers the BM Strategy

Mean (BM_i , …,BM_n) – Mean (BS_j,…,BS_z) < 0 ↔the user prefers the BS Strategy

Similarly,

Mean (DH_i , …,SP_n) – Mean (DH_j,…,SP_z) > 0 ↔the user prefers the DH Strategy

Mean (DH_i , …,SP_n) – Mean (DH_j,…,SP_z) < 0 ↔the user prefers the SP Strategy

Our basic assumption is that in a scenario in which there are many opportunities and when an individual has control, s/he will choose BM, and therefore BM>BS. When s/he does not have control, s/he will choose BS, and therefore BS>BM. As stated earlier, *OpChoice* (or OpC) is the scale for strategy choice when the situation shows many opportunities, and *ThChoice* (or ThC) is the scale of strategy choice when the situation is threatening.

4.6.3. Validity

Partial Least Squares (PLS) was used to further analyze the validity of the measurement. Tests were performed with SmartPLS (Ringle et al. 2005). PLS is particularly appropriate for our study since it has fewer distributional assumptions than covariance based applications such as LISREL or AMOS. Also, another major reason for choosing PLS is that, following Chin et al. (2003) and Goodhue et al. (2007), the PLS approach is more powerful than regression analysis with its summated scales for the detection of moderation effects. Because we posit moderation effects of Espoused IC in our model, the PLS approach was more

appropriate for testing.

Convergent and discriminant validity can be assessed through the analyses of cross loadings. The cross loadings in Table 3-7 below indicate that all items load significantly on their intended constructs. The instrument thus shows appropriate convergent validity. Also, the results in Table 4-7 provide evidence that items load greater on their intended constructs than on any other construct, which demonstrates discriminant validity (Boudreau et al. 2001).

Table 4.7. Cross Loadings

Item	Cross Loadings - Opportunity Scenario		Cross Loadings -Threat Scenario	
	EIC	**EUA**	**EIC**	**EUA**
EIC3	**.77**	.08	**.44**	.08
EIC4	**.87**	.23	**.82**	.23
EIC5	**.76**	.22	**.91**	.22
EUA1	.18	**.88**	.21	**.85**
EUA2	.21	**.84**	.24	**.90**
EUA3	.16	**.75**	.19	**.69**

OpC = OpChoice, strategy choice when the situation has many opportunities
ThC = ThChoice, strategy choice when the situation has many threats
EIC = Espoused Individualism-Collectivism
EUA = Espoused Uncertainty Avoidance

A second criteria to assess discriminant validity is the analysis of the Average Variance Extracted Matrix (AVE). The values on the diagonal have to be greater than values outside the diagonal. While the literature according to Boudreau et al. (2001) does not tell us how much greater the values on the diagonal should be, we are confident that those in Table 4-8 below prove discriminant validity, confirming prior results.

Table 4.8. AVE Matrix

Items	AVE - Opportunity Scenario					AVE -Threat Scenario				
	CR	**AVE**	**EIC**	**OpC**	**EUA**	**CR**	**AVE**	**EIC**	**EUA**	**ThC**
EIC	0,84	0,64	**0,80**			0,78	0,56	**0,75**		
EUA	0,86	0,68	0,22	**0,82**		0,86	0,67	0,26	**0,82**	
Opc/ThC[1]	-	-	0,11	0,00	**1,00**	-	-	-0,09	0,12	**1,00**

[1]Opc = OpChoice, ThC = ThChoice; EIC= Espoused Individualism-Collectivism; EUA = Espoused Uncertainty Avoidance
CR = Composite Reliability; AVE=Average Variance Extracted

SmartPLS also provides reliability statistics through its Composite Reliability. Similar to Cronbach's Alpha, this statistics is at acceptable levels, ranging from .78 to .86 for espoused

cultural values.

Overall, given the results above, we can conclude that our instrument has acceptable measurement properties.

4.7. Results

After examining the measurement properties of our instrument, we tested hypotheses regarding user choices of strategies of adaptation.

4.7.1. Direct effects

We first included age and gender as control variables in the model. Since these control variables were not found significant for either strategies of adaptation, we did not include them in further analyses.

OPPORTUNITY CONDITION. The results show that control is positively associated with choice of a BM strategy ($\beta = .34$, $p<.000$) rather than of a BS strategy. Next, we found EUA is directly and significantly related to greater preference of a BM strategy over a BS strategy ($\beta = .32$, $p<.000$). H_{1a} is thus validated.

THREAT CONDITION. As expected, the results for the threat condition indicate that control is significantly and positively associated with the choice of a DH strategy of adaptation over a SP strategy ($\beta = .22$, $p<.005$). We also found a significant influence of EUA on ThChoice ($\beta = .20$, $p<.005$). This means that the more users espouse uncertainty avoidant values, the more they adapt to the situation with a DH coping strategy. H_{1b} is thus validated. The results of the bootstrap with 500 resamples are shown in Table 4-9 below.

Table 4.9. Path Coefficients (Full Model)

Dependent Variable	Independent Variable	Original Sample	Sample Mean	Standard Deviation	Standard Error	T-Statistics
OpChoice	Control	.34	.34	.06	.06	6.13***
	EIC x Control	-.17	-.16	.06	.06	2.73**
	ECI	.05	.08	.05	.05	.90
	EUA	.32	.31	.07	.07	4.28***
ThChoice	Control	.22	.22	.07	.07	3.21***
	EIC x Control	-.08	-.11	.05	.05	1.56
	EIC	-.13	-.15	.06	.06	2.11*
	EUA	.20	.20	.07	.07	2.70**

EIC = Espoused Individualism-Collectivism; EUA = Espoused Uncertainty Avoidance

*p<.05, **p<.01, *** p<.001

4.7.2. Moderation Effects

Direct effects posited in the models where thus found to be significant. The assessment of moderation effects requires further calculation. Given a dependent variable X and a dependant variable Y, according to Carte and Russell (2003, p. 3), Z is a moderator if "the nature of the X →Y relationship varies as a function of Z". We posited that IC had a moderating influence on the relationship between control (CO) and the choice of a coping strategy. In order to identify the moderating effects of this variable, we followed the guidelines proposed respectively by Chin et al. (2003) and Carte and Russell (2003) which differ each other.

First, consistent with the procedure explained in Chin et al. (2003) and with Goodhue et al. (2007) we created the moderating construct by multiplying the items of the direct effect variable, Control (CO), by the items of the moderating variable, IC. Since IC is reflective, we standardized indicators before multiplication. In fact, standardization as well as the items cross multiplication were directly computed by SmartPLS (Ringle et al. 2005). We then followed the hierarchical process described by Chin et al. (2003), comparing a model with the interaction construct with another model called the main effects model without the interaction construct. A pseudo F-test was then computed. According to Cohen (1988), a pseudo-F with a value of .02 the effect is small, with .10 it is medium, and with .15 it is strong. The results of the analyses are given and detailed in Table 4-10 below.

Table 4.10. Effect Size

Path	Beta	T	R^2 Main Effect Model	R^2 Interaction Model	Δ	f^2	Interpretation
[EIC x CO] → [CO → OpChoice]	-.17***	2.73	.21	.23	.03	.04	Small
[EIC x CO] → [CO → ThChoice]	-.08	1.56	.08	.08	.01	.01	N.S.

EIC = Espoused Individualism-Collectivism; CO = Control
p< .05, ** p<.01, *** p<.001
N.S. = Non-Significant; CO= Control

OPPORTUNITY/CONTROL CONDITION. The results given in Table 3-9 and Table 3-10 are a standardized beta of .34 from CO to OpChoice, of .05 from EIC to OpChoice, and of -.17 for the interaction term CO x EIC with a total R^2 of .25. According the Chin et al. (2003) procedure, one standard deviation increase in IC will have an insignificant impact of .05 on OpChoice, but it decreases the impact of CO on OpChoice from .34 to .17. Further, Table 3-10 shows that the squared multiple correlation (R^2) of the main effect model (R^2 = .21) is smaller than the one of the interaction model (R^2 =.23). The effect size of the interaction construct is thus f^2 = .04, which is between small and medium (Cohen 1988). From our analyses, we conclude that high collectivistic subjects are less likely to adopt a BM strategy for a given level of control, while high individualist subjects tend, conversely, to adopt a BM strategy. Therefore, H_{2a} is validated.

THREAT/CONTROL CONDITION. Following the procedure of Chin et al.(2003) (2003), we failed to find a moderating effect of IC on ThChoice when the situation has many threats. Following this procedure, therefore, H_{2b} is not validated. However, while not hypothesized, we found a significant direct effect of IC (β = -.13, p<.005) on ThChoice. Irrespective of control, it means high collectivistic individuals have a greater preference for a SP coping strategy than low collectivistic ones.

To test for moderation effect, Carte and Russell (2003) suggest a different procedure from that of Chin et al. (2003). Because moderation effects calculations can lead to major errors of

interpretation, these researchers suggest a set of guidelines to further ensure the existence of interaction effects. In this analysis, we have been cautious in avoiding the nine errors they highlighted, as shown in Appendix 1. To assess a moderating effect, Carte and Russell (2003) suggest the calculation of a F-statistic that has to lead to the rejection of $H_0 = \Delta R^2 = 0$. As opposed to Chin et al.(2003), who took into consideration the estimated β of the interaction term, Carte and Russell (2003) believe that only the ΔR^2 effect size is important to estimate interaction effects. They argue that, in particular, when interval scales are used, measurement units are arbitrary (Carte et al. 2003, p. 6). Therefore, they suggest the calculation an F-Statistic given by the equation (E) below:

$$\textbf{(E):}\ F\left(df_{mult} - df_{add}, N - df_{mult} - 1\right) = \frac{\Delta R^2 / \left(df_{mult} - df_{add}\right)}{(1 - R^2_{mult}) / (N - df_{mult} - 1)}$$

Following this formula, Carte and Russell (2003, p. 3) argue that an F significantly higher than 1.00 leads to the rejection of $H_0 = \Delta R^2 = 0$. However, Carte and Russell (2003) do not provide any guideline about how much greater than 1.00 should the F statistic be. The results of calculating the equation above are given in Table 4-11 below:

Table 4.11. F Test

Moderator	N	R^2_{add}	R^2_{mult}	ΔR_2	F	Interpretation
[IC x CO] → [CO x OpChoice]	207	0.21	0.23	0.03	7.46	H0 = ΔR2 = 0 rejected
[IC x CO] → [CO x ThChoice]	207	0.08	0.08	0.01	1.33	H0 = ΔR2 = 0 not rejected
EIC = Espoused Individualism-Collectivism, CO = Control						

The results show that with F=7.46, the F statistic is much greater than 1 for the opportunity condition, leading to the rejection of $H_0 = \Delta R^2 = 0$ and to the conclusion that EIC is a significant moderator of the relation between control and coping strategies. When the situation is threatening, we obtain F=1.33, which is, however, marginally greater than their 1.0 threshold. We thus cannot clearly reject the null hypothesis. Following the formulation of

Carte and Russell (2003), EIC is thus not a significant moderator to the relation between CO and ThChoice, which did not validate H_{2b}.

Therefore, according to both the procedure suggested by Carte and Russell (2003) and Chin et al.(2003), IC has a significant moderating effect on user coping strategies of adaptation in opportunity condition but not in threat condition. Overall, our model is thus strongly supported since all but one hypothesis are strongly supported, the remaining one being partly supported. Hypotheses are summarized in Table 4-12 below.

Table 4.12. Summary of Hypotheses

Hypotheses	Validated (Yes/no)
H_{1a}: In the case in which the technology offers many opportunities, individuals who espouse high UA national cultural values will tend to adopt a BM coping strategy of adaptation rather than a BS strategy of adaptation.	Yes
H_{1b}: In the case in which the technology offers many threats, users who espouse high UA national cultural values will tend to adopt a DH coping strategy of adaptation rather than a SP coping strategy of adaptation.	Yes
H_{2a}: In the case in which the technology holds many opportunities, the higher the control they have over the situation, the less users who espouse more collectivistic national cultural values are likely to adopt a BM coping strategy of adaptation rather than a BS coping strategy of adaptation.	Yes[1]
H_{2b}: In the case in which the technology holds many threats, the higher the control over the situation, the less users who espouse more collectivistic national cultural values are likely to adopt a DH coping strategy of adaptation rather than a SP coping strategy of adaptation.	No[1]

[1]The hypotheses were tested following both the methodology for moderation identification of Carte and Russell (2003) and that of Chin et al. (2003). A significant direct effect of IC on ThChoice has been found.

4.8. Common Methods Bias

Overall, hypotheses were strongly supported. We also needed to examine the data for common methods bias. Podsakoff et al. (2003) provide measures and guidelines for dealing with this problem. In order to control for the occurrence of common methods bias in our analyses, we applied three techniques described below.

The first technique involves "controlling for the effects of a single unmeasured latent method factor" (Podsakoff et al. 2003, p. 894). To make this test, we relied on Liang et al. (2007) who provide detailed explanations on how to apply this technique with PLS, even though it was originally designed for covariance based SEM software. According to those researchers, "If

the method factor loadings are insignificant and the indicators substantive variances are substantially greater than their method variances, we can conclude that common method bias is unlikely to be a serious problem" (2007, p. 87). Overall, we found that common bias was not a concern in our study. The detailed analyses following the single factor test are reported in Appendix B.

We further analyzed common methods bias using a second technique, an exploratory factor analysis that is known as the Harmon single factor test (Podsakoff et al. 2003). Because 1) we found more than one factor emerging from a principal component analysis, and 2) we found no general factor accounting for the majority of the variance, we can conclude, from this method likewise, that common methods bias is not significant.

Finally, the third technique is the analysis of the AVE matrix in Table 3-8, which shows that correlations among constructs are well below the generally accepted level of .90, which is evidence of common methods variance.

Three tests have been applied to test common methods variance. All three tests are evidence that common methods bias do not significantly impact our analyses.

4.9. Limitations and Future Research

This study has several limitations. A first limitation is that while a user can formulate preferences and well defined, rational strategies, it may not always be the case that they act only rationally. It has been proposed that people have bounded rationality (March et al. 1958), for example. Thus, the influence of contextual variables such as urgency at work and/or crisis might be explored in future research.

A second limitation is about the way we assessed disruptive technologies. While we investigated scenarios where the technology was disruptive, we did not compare it with non-disruptive technology. Even though the literature has largely examined user responses to IT in non-disruptive cases, future research could and should simultaneously compare user responses to disruptive and non disruptive IT.

Third, adaptive strategies and the impacts of espoused cultural values may differ depending on whether use is mandatory or voluntary. Indeed, while technology adoption has been extensively studied in voluntary contexts, strategies of adaptation to voluntary usage IT remains largely unexplored. Future research can test the impacts of system use mode, whether voluntary or mandatory usage.

Finally, some may consider the use of student subjects for this research lacks critical realism and is a threat to external validity (Gordon et al. 1986). However, most of the subjects who took part to the study did have professional and working experience, or were currently working. Furthermore, the management controller position is a very likely entry position, especially in France. Therefore, we believe that these student subjects were appropriate surrogates for management controllers. That is, a free simulation experiment in a real world setting with real world management controllers would certainly offer additional insights in future research. One merit of the current scenario, however, is that it permits people to answer more freely, without the real world pressures, that of their job and the constraints it imposes. Future research using a free simulation experiment could conceivably test the model by minimizing any common methods bias that might occur.

Future research would do well to try to identify other adaptive strategies to IT change. In particular, studies from the qualitative traditions of research provide promising insights into

how users adapt to IT. In an attempt to exploit the results of those studies, quantitative researchers should identify, formalize, and analyze interesting results from the qualitative tradition. For example, researchers who have highlighted strategies from actors faced with disruptive IT (Boudreau et al. 2005; Vaast et al. 2005). Boudreau and Robey (2005) show that over time, people respond to a disruptive IT implementation first by a limited use of that IT (inertia) and then by using the IT in unintended ways in order to compensate its deficiencies and their limited control over it. Quantitative researchers might identify the chain of causality between these strategies, their antecedents, and their outcomes (Robey et al. 1996).

Following Lazarus and Folkman (1984), the results of this study suggest that first and secondary appraisal should not be interpreted as sequential. Like found in other research (Chattopadhyay et al. 2001; Crozier et al. 1977; George et al. 2006), threat/opportunity and control appraisal can be considered to be interrelated one another. Beaudry and Pinsonneault (2005) recognize this mutual influence and even a reappraisal process in which adaptive strategies influence in turn the appraisal of the situation. Furthermore, the level of control over the situation is often conceptualized as a facet of an overall variable of Threat/Opportunities, as was found in prior studies (Chattopadhyay et al. 2001; Crozier et al. 1977; George et al. 2006). Therefore, a competing conceptualization would probably analyze the interaction effects of control and threat / opportunity (Lazarus et al. 1984). This is also consistent with Bagozzi (1992a) who posited that there are interacting appraisal processes during goal formation. Future research could thus explore avenues for enhancing CMUA in order to better take into account the relationships between the first and second appraisal.

Also, espoused cultural values is an alternative approach for measuring culture at an individual-level of analysis and a reasonable response to the criticisms of group level approaches employed by several IS researchers (Hwang 2005; McCoy et al. 2005; Srite et al.

2006). Espoused cultural values are not without their own difficulties, but it does represent a step toward addressing many issues, such as those mentioned earlier. Three main limitations to this approach are discussed with respect to individualism-collectivism by Oyserman et al. (2002, p. 7):

> (1) First, the direct assessment approach assumes that cultural frame is a form of declarative knowledge (e.g., attitudes, values, and beliefs) that respondents can report on rather than some set of more *subtle and implicit practices and social structures* that respondents cannot report on because these practices are deeply woven into everyday life and are a normal part of living (p. 7).
>
> (2) Second, this approach assumes cross-cultural convergence in the meaning assigned to scale-response choices (p. 7).
>
> (3) A final limitation of the direct assessment approach is the assumption of cross-cultural convergence in the questions that must be answered to tap into the underlying dimensions of IND and COL (p. 7)

Overall, the debate on the measurement of culture is thus far from being closed. There is disagreement on how cultural differences should be measured, some advocating methods based on indices such as those elaborated by Hofstede (Schimmack et al. 2005), others urging the application of other improved methods (e.g., Gallivan and Srite 2005; Hwang 2005; McCoy et al. 2005; Oyserman 2006; Srite and Karahanna 2006; Straub et al. 2002). Research on IS and culture has a long history but the extent to which researchers disagree on related issues sheds light on the often omitted discussion about important conceptual issues such as that of level of analysis. Researchers are thus encouraged to try to address these issues in order to improve our measurement of cultural impacts.

Notwithstanding the above limitations and areas to further explore, this study has important implications that we discuss next.

4.10. Discussion of Results

The aim of this study was to: 1) develop measures for the Coping Model of User Adaptation; 2) to apply CMUA to user adaptation to disruptive technologies; and 3) to determine the impacts of espoused cultural values on user adaptive strategies.

Our results suggest that the overall model was well supported. Furthermore, our study significantly augments CMUA in identifying the influence of two relevant espoused cultural values on user adaptive strategies. Espoused EIC showed a significant moderating effect on the relation between control and user adaptive strategies when the situation poses opportunities. Indeed, collectivistic people tend to favor less an active behavior and tend to adopt more benefits satisficing strategy of adaptation when the technology offers opportunities than more individualist persons. When the situation is threatening, however, the influence of EIC is only partially supported.

Also, EUA is shown to be a very significant espoused cultural value that directly influences user coping adaptive strategies to disruptive IS. Our study confirms results from prior research stating that users are likely to favor problem-focused adaptation to change while it is perceived as ineluctable (Geletkanycz 1997). Indeed, it has been identified that executives in high uncertainty avoidant countries tend to adapt to change when they cannot do differently (Geletkanycz 1997). Specifically, in the case of our study, adaptation to technology implementation could appear as a means to avoid more instability, hence more uncertainty in the future. This means that while high EUA individuals can be expected to avoid adaptation in voluntary context of system usage, they are instead expected to adapt to the situation more than low EUA individuals in mandatory contexts of usage. High EUA people tend to anticipate change and to adapt to the situation. Conversely, low EUA people more readily adopt a benefits satisficing strategy in opportunity condition or a SP strategy in threat

condition. These strategies correspond to minimal adaptive efforts but also to the tolerance for more ambiguous situation in the future.

These results diverge from other studies, which link the uncertainty avoidance value to the status-quo and to resistance to change (Doney et al. 1998; Hofstede 2001). The results of this study should be considered to the light of earlier findings suggesting that people behave differently depending on whether the context of the use of the technology is voluntary or mandatory (Agarwal et al. 1998; Bagozzi et al. 1992b; Bagozzi et al. 1990; Brown et al. 2002; Straub et al. 1995; Straub et al. 1998). In this study, indeed, the mandatory system usage context might explain the problem-focused adaptation posture of high EUA users and of those having no control over the situation. Future research should explore whether in voluntary usage context, high EUA users and those who have low control over the situation are be less problem focused than they are when the system usage is mandatory.

The analysis of the two cultural values, EUA and EIC, puts forward the impacts of individual values and personality characteristics on user adaptive strategies. This is particularly important to acknowledge the influence of such values on adaptive strategies in increasingly multicultural work environments and organizational contexts (Srite et al. 2006). A further discussion on this point can be found in Appendix C.

The discussion of the results of this study allows highlighting several contributions for theory and practice in the area of culture as well as in the area of the understanding user adaptation to disruptive IT. We explore those contributions next.

4.11. Contributions

The study makes several contributions to theory and practice. The first contribution of the study is the development of measures for variables in CMUA. We provide a rigorous method and reliable measures for measuring user adaptation to IT, a topic under-investigated. Further validation of our instrument can be carried out in real world setting in order to test the extent of its applicability.

Second, we show that CMUA offers the possibility to open the black box of user adaptation, making us more cognizant of what happens between the use antecedents and use behavior. In particular, we show that CMUA can address major issues arising from the traditional user acceptance and usage stream of research (Benbasat et al. 2007). Research on IT acceptance and use largely ignores user adaptation. Including user coping strategies as moderator or mediator variables may help better explaining individual responses to IT change. Coping strategies of adaptation appear as a missing link in adoption research and we suggest they be included in future research on acceptance and use of IT.

Third, we apply CMUA in a disruptive IT setting and show that the results hold with IT with such effects on work environments. Van der Heijden (2004) stressed the importance of taking into account the kind of technology being implemented. In this study, we show that people, indeed, adapt to these technologies in different ways, depending on how many threats and opportunities they find in the system and its implementation, and how much control they have over the situation.

Fourth, we tested the influence of espoused cultural values on user adaptive strategies of adaptation. While research on IT and culture often focuses on difference in technology

adoption and use across culture, few studies investigated the implications of cultural values on user adaptation to IT. It was thus necessary to focus on these issues.

In addition to contribution to theory, our study has several contributions for a practitioner's audience. In effect, our study suggests that people behave differently depending on their cultural values to newly implemented IT. Our study also takes a different tack from other studies in showing that individuals might follow their own strategies to adapt to IT being implemented. It suggests that even in mandatory use contexts, workers can still adapt in different ways to the technology converging with some conclusions of other researchers (e.g. Boudreau et al. 2005). Eventually, how workers adapt to a system can have important impacts on its overall success. This induces managers to adapt their communication strategy, workers' training, and their overall change approach to insure IT implementation success. The overall contributions of this study are summarized in Table 4-13 below.

Table 4.13. Summary of Contributions

Element of Research	Contributions of Present Study
Coping Model of User Adaptation	Develops measures and validates the model. CMUA has been tested qualitatively on a small sample of managers and further investigation is needed.
Understanding of User Adaptation to IT	Offers a unified view of user adaptation to IT taking into account variance and process approaches.
Better Understanding User Acceptance of IT (Use, Intention to Use)	Opens the black box of the models of user of acceptance of IT. Permits us to envisage agency and emotions in the process of adaptation to IT.
Voluntary/Mandatory Settings	Determines user adaptation in mandatory settings, while most prior research focused in voluntary settings.
Espoused Cultural Values	Considers the impact of uncertainty avoidance and individualism-collectivism values on user strategies of adaptation to disruptive IT. The approach of cultural values is intended to overcome some of the limitations found in studies typically comparing people from several countries.
User Responses to Disruptive IT	Addresses the issue of user adaptation to disruptive IT. Very often, the technology is assumed to align well with the processes and individuals needs in the organization.

4.12. Conclusions

Change evoked by disruptive IT can be particularly threatening for users who are also social actors (Lamb et al. 2003). Positivist research in IS has often neglected this and the need to

take into account user adaptation to IT and subsequent systems usage. This has created a "black box" which we attempt to partially open in this study. Following CMUA of Beaudry and Pinsonneault (2005) and based on the Theory of Coping (Lazarus et al. 1984), our study is a step toward enriched IS models of acceptance and use of IT.

By studying the impacts of espoused cultural values (Srite et al. 2006) on user adaptation, our study also contributes to a better understanding the influences of national culture on these behaviors. In doing so, we adopt an individual level measurement of culture, which is an improvement as compared to traditional ways of studying national culture through Hofstede's indices.

4.13. Appendices

4.13.1. Appendix A. Questionnaire Items		
Constructs- Authors	**Code**	**Items**
		Scale: 1-Strongly Disagree…7-Strongly Agree
Espoused Individualism/Collectivism (Srite and Karahanna 2006)	IC1*	Being accepted as a member of a group is more important than having autonomy and independence.
	IC2*	Being accepted as a member of a group is more important than being independent.
	IC3	Group success is more important than individual success.
	IC4	Being loyal to a group is more important than individual gain.
	IC5	Individual rewards are not as important as group welfare.
Espoused Uncertainty Avoidance (Srite and Karahanna 2006)	UA1	Rules and regulations are important because they inform workers what the organization expects of them.
	UA2	Order and structure are very important in a work environment.
	UA3	It is important to have job requirements and instructions spelled out in detail so that people always know what they are expected to do.
	UA4*	Standard operating procedures are helpful to employees on the job.
Control over Self and over the Technology (Venkatesh et al. 2003)	CS1	I will have control over my use of SysControl.
	CS2	I will have the resources necessary to use SysControl.
	CT1	To use the system effectively I believe I have what I need.
	CT2	When using SysControl, I believe I have a good control over the features of the system.
Control over Work (Shaw and Barret-Powel 1997)	CW1	I have sufficient autonomy in my work so as to be able to adapt my tasks to SysControl.
	CW2	I am independent enough to modify my tasks so as they can be consistent with the requirements of SysControl.
Benefits Maximizing (Beaudry and Pinsonneault 2005)	BM1	My efforts will be focused on maximizing the benefits I can reasonably expect from SysControl.
	BM2	My aim will be to exploit as much as I can the advantages and capabilities provided by SysControl.
	BM3	I will consider using SysControl in order to achieve greater performance.
	BM4	The changes I will perform in my work following the implementation of SysControl will allow me to get maximum value.
	BM5	I will really strive to improve my capacity to effectively work with SysControl.
Benefits Satisficing (Beaudry and Pinsonneault 2005)	BS1	The best I can do is to learn to use the minimum functionalities of SysControl since it may still contribute in increasing my performance in the future.
	BS2	I will be barely satisfied, but still satisfied with the benefits offered by SysControl.
	BS4	I will learn the minimum I need to in order to use SysControl.
	BS5	I have minimal expectations about being satisfied with SysControl.
Disturbance Handling (Beaudry and Pinsonneault 2005)	DH1	While concerned about using SysControl, I do think it could help me to increase my performance.
	DH2	Although SysControl is somewhat confusing, it will probably allow me to be a better controller.
	DH3	I am thinking that with SysControl, after some adjustments, I could expect it to increase my performance.
	DH4	Overall, I can find some potential ways to benefit from SysControl.
Self Preservation (Beaudry and Pinsonneault 2005)	SP1	Given that I have a lot of important things to care about, I would not be likely to pay too much attention to SysControl
	SP2	SysControl will not be much of an interesting system for controllers.
	SP3	SysControl will not help me to be a better controller than I am already.
	SP4	SysControl will not help me to increase my performance at work.

*Items not included in the analyses due to poor psychometric properties.

4.13.2. Appendix B. Application of Carte and Russell's Moderation Guidelines		
#	Error description	Error solution addressed
Inappropriate Use or Interpretation of Statistics		
1	Using b_3 instead of ΔR^2 as an index of moderator effect size.	We relied on both the methodology suggested by Chin et al. (2003) and the methodology suggested by Carte and Russell (2003). Both provide evidence of the moderating effect of EIC.
2	Interpreting B_1 and B_2 when X and Z are interval scale measures.	We only hypothesized a moderating influence of EIC and no main effects.
Misalignment of Phenomena and Research Design		
3	Confounding of $X \cdot Z$ with X^2.	We used the PLS method for our analyses that is not affected by multicollinearity. Further evidence is provided by correlation matrix, R_{xz} range from -.06 to .02, which indicates that this error is unlikely.
4	Incorrect specification of the X →Y versus Y→ X causal sequence.	The relations we posited are based on theory, control is believed to be an antecedent of strategy and not the contrary. Further, the experimental design performed permits us to ensure that control is an antecedent of user strategy of adaptation.
5	Low power of random effects designs.	According to Carte and Russell, this guideline applies mainly for research using survey instruments. Our research is an experiment in which the effect of EIC is a fixed effect. The problem of statistical power in these guidelines thus does not apply. In addition, our sample size is above what is necessary for reasonable statistical power.
Measurement and Scaling Issues		
6	Dependent variable scale is two coarse.	Y has been operationalized as a continuous variable and can thus take an infinite number of values.
7	Nonlinear, monotonic Y transformations.	No transformations have been made. Parametric assumptions are not a concern with PLS.
8	Influence of measurement error on $X \cdot Z$.	This error is unlikely to occur since we use PLS. According to Carte and Russell (2003) following Chin et al. (1996), PLS results are likely to be similar as corrected MMR results.
9	Gamma differences between two groups in PLS.	We did not apply multigroup comparison for testing moderation with PLS. EIC is a modeled as a construct included in the model.

4.13.3. Appendix C. Common Methods Variance Analysis							
Construct	**Indicator**	**SF[1] Loadings (R1)**	**R1²**	**T-Statistics**	**MF[2] Loadings (R2)**	**R2²**	**T-Statistics**
Espoused individualism-collectivism	EIC3	.876**	.768	13.591	-.156**	.024	2.548
	EIC4	.819**	.670	16.767	.060	.004	1.291
	EIC5	.703**	.494	9.488	.090	.008	1.360
Espoused uncertainty avoidance	EUA1	.808**	.654	1.332	.032	.001	.537
	EUA2	.831**	.691	11.084	.027	.001	.480
	EUA3	.843**	.710	8.009	-.063	.004	.757
Espoused individualism-collectivism	EIC3	.890**	.792	11.588	-.170**	.029	2.252
	EIC4	.811**	.658	15.823	.068	.005	1.332
	EIC5	.698**	.487	7.770	.094	.009	1.322
Espoused uncertainty avoidance	EUA1	.838**	.702	11.363	-.006	.000	.127
	EUA2	.827*	.683	1.922	.033	.001	.575
	EUA3	.816**	.665	8.501	-.030	.001	.474

[1]Substantive Factor Loadings, [2]Method Factor Loadings

*p< .05; **p<.01

4.13.4. Appendix D. Experimental Scenario

General Context: Background on BestInsurance Inc.

Please read the following text carefully.

You are a management controller at BestInsurance, a major insurance company. BestInsurance is concerned that even though it has many management controllers, it still lacks capabilities in its management controlling activities, including financial reporting and forecasting. In comparison with other companies in its class, BestInsurance is late in implementing and using information technologies.

Therefore, the top managers of BestInsurance have decided to overhaul its old information system in order to improve financial processes with a single unified system. Today, you have been told that SysControl, the newly implemented Enterprise Resource Planning (ERP) system, has just been launched and that you can begin to use it.

SysControl integrates and automates all major data processes related to financial control at BestInsurance. SysControl is expected to result in more accurate and faster financial reporting. Working with SysControl will be a revolution for employees at BestInsurance, and primarily for management controllers and accountants who are first in line for using it. Indeed, the way business processes have worked previously at BestInsurance has been technologically antiquated and not very effective.

Top managers expect management controllers to fully use SysControl since improving costs and process control is essential for remaining competitive. They are convinced of management controllers' interest in using SysControl since they believe it will help them achieve greater performance with more added value in their work. The facts of this case are summarized in the Table 1 below.

Manipulation

Opportunity condition

You believe SysControl can affect you positively, both personally and professionally. It offers a lot of opportunities to improve your performance. Like many of your colleagues, you see in SysControl a way to improve your efficiency (e.g., reducing time and effort), your effectiveness (e.g., improving the quality of work output), and your overall performance. That is, you believe you would be a better controller if you used

SysControl and adapted your work to it, than if you continued working with the old BestInsurance systems and procedures. In order to be able to use SysControl, you realize that you will need to learn new skills and to make adaptations to your work procedures.

Threat Condition

At the present time, you believe SysControl can affect you negatively, both personally and professionally. Like many of your colleagues, you are afraid that BestInsurance will use SysControl to cut jobs. In addition, you think the system is unlikely to help you to improve your efficiency (e.g., reducing time and effort), your effectiveness (e.g., improving the quality of work output), and your overall performance. Conversely, you think it can increase errors and lower the overall quality of your work. That is, you believe you would be better off using legacy systems and procedures than working with SysControl. In order to be able to use SysControl, you would need to learn new skills and to adapt your work procedures in a major way.

Control over the Situation: Control

However, even with these reservations (threats) / You believe you have a great deal of control over the situation. Indeed, you believe you have autonomy in your job and that you are able to modify your tasks when using a system like SysControl. You also believe that you can adapt yourself to the new environment created by the implementation of SysControl. Finally, you feel that you have a lot of control over the features and functionalities of SysControl since you have been involved in its development and well understand how to utilize it beneficially.

Control over the Situation: No Control

In addition to these reservations (opportunities) / "unfortunately" (threats), you believe you have little control over the situation. Indeed, you believe you do not have sufficient autonomy over your job and that you are not able to modify your tasks in response to SysControl. You also believe that you cannot adapt yourself to the new environment created by the implementation of SysControl. Finally, you feel that you have little control over the features and functionalities of SysControl since you have not been involved in its development and do not understand well how to utilize it beneficially.

4.13.5. Appendix E. A Few Implications of Espoused Cultural Values

The conceptualization of culture as espoused values makes at least two important points. The first implication is that we changed the level of analysis as compared with most prior research. This allows the current research to avoid the ecological fallacy (Morgeson et al. 1999; Srite et al. 2006). Indeed, a nation-state approach to culture makes culture a collective level construct, while cultural values imply that culture be analyzed at an individual level (Morgeson et al. 1999; Srite et al. 2006). According to Morgeson and Hofmann (1999):

> It is not the collective construct, per se, that determines the behavior of individuals – rather, it is the individuals (or collective) who determine the collective construct, and, through their actions, influence the behavior of others in the collective (p. 253).

Aggregating individual level measures of culture could result in a higher level, collective construct of culture, for example at a national level, but Morgeson and Hofmann (1999) argue that the collective construct is not equivalent to the aggregation of the an individual-level construct. According to the researchers investigating groups, one should analyze a group members' individual characteristics while in the same time considering how those interact and operate within the group (Morgeson et al. 1999, p. 260).

In addition, people living in a same country often have different cultural background and experiences (Straub et al. 2002). In our study while investigation was conducted in two countries, people from 24 nationalities were among the participants. What this shows is that while researchers often omit discussing the diversity among people from a single sample, homogeneity is far from being a warranted assumption(Straub et al. 2002), especially in western countries. The fact that subjects live in a same country is thus not a guarantee that those subjects share the same culture and values. Even with people having the same national culture affiliation, deducing how the collective construct works is not straightforward. That's

true that, comparing countries based on Hofstede's indices can result in marked differences between samples. However the rationale behind such a conceptualization if often silent on how the collective construct develops and evolve over time and what is the role of interpersonal interactions (Dorfman et al. 1988; Morgeson et al. 1999). Rather, reasoning at the individual level of analysis avoids these problems, while still maintaining explanatory power on explaining user adaptation to IS.

The second implication of conceptualizing culture as espoused cultural values is that of a change in the very nature of the measured construct. Indeed, traditional conceptualizations consider culture to be a "collective programming of the mind," as defined by Hofstede (1980). Following the most frequent conceptualization of individual differences in MIS research highlighted by Zmud (1979), measuring culture as a collective construct involves analyzing culture as a demographic/situational characteristic of individuals. Conversely, measuring culture with individual level constructs – such as espoused cultural values – involves analyzing personality characteristics. According to Morgeson and Hofmann (1999), it is possible to study collective construct using individual level instruments – such as in Hofstede study (1980). However, this involves considering participants to a study only as "informants about collective processes" (Morgeson et al. 1999). Rather, studying culture as an individual construct would focus on the motivation of individuals (Morgeson et al. 1999). Additionally, Morgeson and Hofmann (1999, p. 155) argue that "functions generally remain the same across levels". This means that the patterns of influence and the interpretation of cultural values are similar at the individual level and at the collective level, for example when measuring Hofstede cultural dimensions at the collective level and at the individual levels of analysis (Dorfman et al. 1988; Hwang 2005; Srite et al. 2006). However, the domain of interest is changed because investigating on cultural values, one studies identifiable enduring personal - rather than collective - characteristics or attributes (Klein et al. 2004).

Chapter 5

Managerial Responses to IT: The Case of French Public Middle-Managers

Abstract

Understanding how middle-managers respond to e-government (e-Gov) initiatives remains an understudied issue. In this paper, we examine how public middle-managers exercise human agency during an information system (IS) implementation process and how this helps making producing changes on the field. Drawing on human agency (Emirbayer et al. 1998) and strategic actor theory (Crozier et al. 1977), we explain why a system that was praised by unit managers when referring to their expectations, resulted in contradictory enactments. We suggest system constraints emanate from unit managers willing to adopt "winning" scenarios for action, in which they would contribute to modernizing public administration. We then show public middle managers' practical actions in contributing to e-Gov stem from the resolution of the contradictions in their temporal orientations. We argue that these practical evaluations are what allow IT change to be implemented in practically acceptable ways. We conclude with contributions for research and practice.

Keywords: Human Agency, Strategic Actor Theory, Middle-managers, Public Administration, Disruptive IT, IT Change, Structures.

5.1. Introduction

Understanding how information systems (IS) contribute to transforming public administration is of growing interest (Assar et al. 2005; Avgerou et al. 2007; Grönlund et al. 2004). A key issue in e-Government research is still to understand how to manage change successfully in these organizations (Fernandez et al. 2006). The purpose of this article is to contribute to Information Systems (IS) research with insights on middle-managers' responses to IT change in public administration. Specifically, we attempt to understand how middle managers contribute in making IT resulting in change.

The public sector employed 23% (report on the state of public administration 2007-2008) of the French working population in 2007. It is evolving from a judicial perspective based on norms and procedures to a managerial perspective where management principles partly inspired from private organizations are instilled in practices (Arkwright et al. 2007). The new orientations emphasize service delivery quality and interoperability across public administrations and their stakeholders (Ho 2002). In these new orientations toward *modernization*, middle-managers are probably key actors in the success of e-Gov in the French public sector. However, while researchers and practitioners still report high rates of failure of e-Gov projects (Assar et al. 2005; Irani et al. 2007; Rorive et al. 2005; Saint-Amant 2005), few studied specifically middle-managers' interpretation and enactments of these projects.

Middle-managers are often depicted as being among workers most affected by IT-driven changes in organizations (Applegate et al. 1988; Larsen 1993; Leavitt et al. 1958; Millman et al. 1987; Pinsonneault et al. 1993; Pinsonneault et al. 1998). Their role has been found to be prominent in large bureaucracies such as public administration, in which decision making is centralized and regulations are formal (Crozier 1964; Crozier et al. 1977; Currie et al. 2002;

Fernandez et al. 2006). They are depicted as actors who are capable to promote an appropriate and efficient functioning of democracy (Morgan et al. 1996) in ensuring service delivery to external stakeholders and regulations application. They are key actors in the IT change process and are said to have the capability to contribute to IT implementation (Leonard-Barton et al. 1988). They are thus probably in best position to resolve emergent system problems and misfits in local units. According to Balogun and Johnson (2004), "researchers need to understand how middle-managers interpret change, and how their schemata, or interpretive frameworks, develop and change" (p. 523). Also, Rouleau (2005) suggests middle-managers should be viewed as "interpreters and sellers of strategic change at the micro level" (p. 1414). This sensemaking process and middle-managers interpretations of strategic change initiatives are likely to be linked to its success or failure (Rouleau 2005). Understanding how middle managers behave during IT change is also important for understanding the evolution of their work and roles. Indeed, echoing a broader debate in the management literature (Applegate et al. 1988; Millman and Hartwick 1987; Pinsonneault and Kraemer 1993; Pinsonneault and Kraemer 1997), some researchers have raised the issue of the future of public middle managers, suggesting that this category of workers may dramatically decrease in size in local public sector in the future (e.g., Morgan et al. 1996).

However, these mitigated findings make even more important to examine more in depth how middle-managers interpret e-Gov and, conjunctly, how they exercise agency within their work units during IT implementation. Accordingly, in this paper, we specifically examine public middle-managers' agency and responses to IT during the implementation of a disruptive IS.

Agency has been defined in prior works as "the capacity of human beings to act in ways not predetermined by social structures" (Chu et al. 2008, p. 80). A number of researchers attempted to address the role of IT in social actors' enactments. This is especially the case of

researchers drawing on structuration research (Orlikowski 1992; Orlikowski 2000; e.g., Orlikowski et al. 1991) based on Giddens' theory of structuration (Giddens 1984), and who attempted to understand the relationships between the IT and organizations. For example, Orlikowski sees the IT as embedding the structure (Orlikowski 1992). In another study, this researcher suggests a "practice lens" and considers IT structures emerge from recurrent use of IT (Orlikowski 2000). In these researches, however, human agency remains a "black box", which makes our understanding of the relationships between agency and structures incomplete. Furthermore, Jones and Karsten (2008) note that these issues in structurational research are among those which received least consensus in the IS community. For that, in studying middle-managers' responses to IT implementation it is important to open this "black box" of human agency in the course of IT implementation.

Emirbayer and Mische (1998) offer an interesting conceptualization of human agency in which they distinguish social actors' orientations toward the past, the present, and the future. Prior research applied this theory to the IS field and suggested these temporal orientations offered important knowledge of how actors elaborate practical responses to dilemmas arising during IT implementation and use (Boudreau et al. 2005; Chu et al. 2008; Cousins et al. 2005). Interestingly, temporal orientations could also be seen as a means to account for the role of reflexivity in human action (de Vaujany 2008). However, social actors' temporal orientations, the researchers argue, have received unequal attention in prior research. While orientation toward the past (the iterational element) is often referred to, the projective element (orientation toward the future) and, to the largest extent, the practical evaluative element (orientation toward the present) have been largely neglected (Emirbayer et al. 1998). Also, since, this theory of human agency offers little insights about the role of structures (Fuchs 2001), it is therefore necessary to complement it with insights about structural constraints (Boudreau et al. 2005; Chu et al. 2008). Strategic actor theory (Crozier et al. 1977) can, we

believe, help dealing with these issues. This theory places the game at the center of the relationship between agency and structure. While this theory helps complementing the projective and practical evaluative temporal orientations of human agency, it also places games in which social actors are inserted at the center of their acceptance of structural constraints.

For that, and in order to understand how middle-managers respond to IT implementation, we draw primarily on temporal theory of human agency (Emirbayer et al. 1998), a theory that we complement with strategic actor theory (Crozier et al. 1977). The research questions we address are the following:

(1) What role do structural constraints play in the development of managers' enactments and responses to changing IT environments in public administration?

(2) What roles do middle-managers temporal orientations play in the formulation of their responses to IT change?

In order to answer these questions, we applied an interpretive case study (Klein et al. 1999) within local units of a French governmental administration. We investigate the actions taken by local unit managers, following the implementation of the IS.

The paper begins by highlighting the contribution of middle-manager to IT strategic change as identified in prior research, as well as the relations between agency and IT structures. We then present selected theories and justify the complementarity of the temporal theory of human agency (Emirbayer et al. 1998) and strategic actor theory (Crozier et al. 1977) for answering our research questions. The method and results sections follow. The discussion highlights how middle-managers reconcile competing logics around e-Gov. We conclude with the limitations of the study and its contributions for research and practice.

5.2. Middle-Managers and Strategic IT Change

It has already been suggested that top public managers have determinant roles in fostering IT implementation success in public administration (Caudle et al. 1991; Fernandez et al. 2006). Middle managers can also play an important role in the institutionalization of change and in the evolution of work practices in these organizations (Fernandez et al. 2006). Other researchers found that middle managers' leadership hardly play any role in unit performance in public sector organizations (Javidan et al. 2003). Overall, however, middle-managers are said to play a major role in contributing to strategic change within organizations (Balogun et al. 2004; Floyd et al. 1997; Rouleau 2005). Because of their central position in organizational structures, middle-managers can be considered to be links between lower and upper managerial levels (Burgelman 1983; Pinsonneault et al. 1993). They also have a potential role in selling strategic initiatives to top managers (Balogun and Johnson 2004; Burgelman 1983; Floyd and Wooldridge 1997; Schilit 1987) and implementing strategic decisions (Schilit 1987).

Middle-managers may of may not have good knowledge of corporate decisions; however, because of their unique knowledge of how operations are performed on the field, they are likely to be in the best position to resolve any contradictions arising from the gaps that might exist between top management strategic initiatives and operations (Currie et al. 2002; Jasperson et al. 2005). This suggests they have a mediating role between top management decisions and operations. It allows them translating organizational rules into operational procedures and work practices (Currie and Procter 2002; Floyd and Wooldridge 1997; Pinsonneault and Kraemer 1993; Rouleau 2005). IS researchers suggest that middle-managers' interventions are likely to be directed toward "directing modification or

enhancement of IT application, incentive structures, or work tasks / processes" (Jasperson et al. 2005, p. 537).

How do middle managers exercise their strategic influence in organizations? Floyd and Wooldridge (1997) distinguish middle-managers' upward and downward strategic influence within organizations. Upward influence includes roles such as information synthesis and championing. Downward influence deals with the facilitation of adaptability and to the implementation of deliberate strategy. Middle-managers are also change agents and strategy implementers in that they engage in actions that can foster the successful implementation of deliberate strategy. They do so by translating the deliberate strategy at the level of subordinates, e.g., into action plans, or individual objectives (Balogun et al. 2004; Floyd et al. 1997; Rouleau 2005). More specifically, Rouleau (2005) identifies four categories of strategic sensemaking and sensegiving in middle-managers. They translate the new orientations of their organization, they overcode its strategy, they discipline the clients, and they justify change to outside people.

Research on middle-managers and IT also attempted to identify their contribution specifically to IT implementation (e.g., Larsen 1993). In this perspective, IT innovations are presented as providing opportunities to middle managers who are more likely to be in position to promote it, in public organizations more than in private ones (Caudle et al. 1991). These studies offer evidence that middle managers' reconcile the competing logics that can arise from their work when IT are being implemented (Currie and Procter 2002; Leidner et al. 1999; Millman and Hartwick 1987; Pinsonneault and Kraemer 1993), and that they contribute to successful IT implementation (Jackson and Humble 1994; Lakhanpal 1994; Larsen 1993; Larsen and Wetherbe 1999; Mangaliso 1995).

Middle managers interventions proceed broadly from a mutual adaptation process involving "organizational structures, task structures, and technology structures that accompanies organizational life and that, invariably, produce both intended and unintended consequences" (Jasperson et al. 2005, p. 536). The need for a mutual adaptation process comes from misalignments between the technology and user environment (Leonard-Barton 1988). Leonard-Barton (1988) argues that in fact, the IT never fits exactly user environments. She suggests that "these misalignments can be corrected by altering the technology or changing the environment – or both" (p. 252). In this mutual adaptation process users are directed at making IT more adjusted to their tasks, which encompasses improvisation (Orlikowski 1996), but also modification of the IT, and reinvention behaviors (Boudreau et al. 2005). These modifications can also lead to unfaithful IT uses (DeSanctis 1994). In that, it is argued that organizations would rather implement changes in both the technology and in user environment together, rather than one at a time (Leonard-Barton 1988). Larsen (1993) found that middle-managers, with positive attitudes towards change, are more likely to contribute to the success of IT and business innovations (p.177). Leonard Baron and Deschamps (1988) suggested managers should provide material support and infrastructures of IT innovations and motivate late adopters in the usage and success of the innovation.

Arguably, middle-managers have thus the capability – and often the responsibility of resolving IT misfits that often occur in Technochange situations (Markus 2004). Markus (2004) argues that Technochange misfits often look like technical misfits, while it can in fact reflect user resistance to change. Middle managers can probably help facilitating its resolution by translating, promoting and justifying change at operational levels (Balogun et al. 2004; Rouleau 2005).

In an attempt to further analyze middle-managers strategic role in organizations, Rouleau (2005) identified four categories of strategic sensemaking and sensegiving in this category of actors. First, middle managers *translate* new orientations of their organization. They explain their company's choices based on their tacit knowledge, and making use of disparate elements about their company that they reassemble. In doing so, they use the language of their interlocutor in order to transmit a message in the best possible way. Second, middle managers have a role of *overcoding* the strategy of their organization. In order to do so, they create meaning for people according to their cultural specificities. Third, middle managers had a role of *disciplining* the client. According to the researcher, "disciplining the clients means that middle-managers, through their routines and conversations, produced subjective and emotional effects whose objectives is insidiously to 'sell' the new strategic orientation to the client" (p. 1428). Fourth, middle managers *justify change* to outside people. The justification of change to the client is based on clients' discourse. This is to "gain the trust of the interlocutor" (p. 1429). This perspective highlights both the boundary spanning roles of middle managers and their role of linking hierarchical groups within organizations and promoting strategic change within their organization.

According to Rouleau (2005), middle managers put into action these micro-practices during strategic change. Further, Rouleau (2005) states that "it appears that middle managers, through their tacit knowledge, strategize by enacting a set of micro-practices that are produced in each routine and conversation surrounding the change" (p. 1431). Finally, Rouleau (2005) claims that research should further examine of the role of agency in the context of sensemaking and sensegiving of micro practices.

Other researchers emphasize politics in the behavior of middle managers (Guth et al. 1986; Westley 1990). For example, it has been shown that some contexts may induce more or less

middle managers involvement in resolving corporate misalignments. Guth and Macmillan (1986) argue that middle-managers have greater engagement in their organizations when organizational strategic orientations are consistent with their self-interest. According to these researchers, although middle-managers involve in strategic decisions, they can reorientate the strategy and have negative influence on it if they feel these decisions play against their self-interest. These results reflect that middle-managers significantly play part in political activity within their organization (Guth et al. 1986).

A summary of insights from prior research relevant for this study and dealing with middle managers' contribution to strategic change is given in Table 5.1 below.

Table 5.1. A few Relevant Studies on Middle-Managers and Organizational Change

Researchers	Key Issues	Key Findings
Floyd and Wooldridge (1997), Rouleau (2005), Balogun and Johnson (2005), Huy (2002)	Explaining middle-managers' contribution to strategic change in organizations	Middle-managers play a strategic influence across organizational levels.
Javidan and Waldman (2003)	Understanding public middle-managers' contribution to unit performance	Middle-managers play hardly any role in unit performance.
Rouleau (2005)	Explaining middle-managers' sensemaking and sensegiving of micro practices	Middle-managers enact four broad type of micro practices. They 1) translate new orientations, 2) overcode the strategy, 3) discipline the clients, and 4) justify change to outside people.
Currie and Procter (2002), Rouleau (2005), Floyd and Wooldridge (1997), Leonard-Barton (1988)	Explaining how middle-managers contribute to aligning the IT, the unit, and corporate strategy.	Middle-managers have the potential to resolve misalignments between IT, user environment and the unit.
Caudle et al. (1991), Currie and Procter (2002), Leonard-Barton (1988)	Middle-managers' contribution to systems implementation	Middle-managers contribute to the success of IT implementation. They have a greater contribution in public sector organizations that in private sectors' ones (Caudle et al. 1991).

These are all insightful contributions about middle-managers enactments in organizations. Though, it is important to clarify what are the relevant properties of IT, which would allow better understanding human agency as exercised by middle-managers and its relation with IT. Although several prior research dealt with this issue with individual users in general, researchers argue, understanding the micro-dynamics of interactions between actors and IT, has long been neglected and is still understudied in IS research (e.g., Vaast et al. 2005). The approach proposed by Rouleau (2005), for example, offers valuable insights on middle

managers specifically, but this research does not raise the IT issue and that of human agency. A number of recent studies that may probably apply to middle-managers provide in-depth understanding of individual interactions with IT. For example, it has been shown that IT outcomes emerge from social actors' representations of their work, institutional structures, and of the IT following a dissonance-consonance process (Vaast et al. 2005). Larif and Lesobre (2004) suggest that system user respond to IT implementation depending on project uncertainty and on their expectations about the new system to be implemented. Subsequently, they argue social actors enact behaviors led by four types of strategies: adhesion, restraint, distrust, or reject. In a similar vein, IT outcomes have been presented as reflecting user strategies of adaptation driven by their appraisal of the IT and the control they have over their work, self and the IT (Beaudry et al. 2005). Beaudry and Pinsonneault (2005) identified benefits maximizing, benefits satisficing, disturbance handling and self-preservation as the adaptive strategies of system users after they learnt about the implementation of a disruptive IT "event". Differently, Chu and Robey (2008) explain IT outcomes as resulting from social actors' resolution of contradictions emanating from their temporal agentic orientations.

It is important to study human agency as exercised by middle-managers, in order to better understand how they may contribute to IT change on the field. Important is to note, however, that researchers remain imprecise in the understanding of the role of IT structural constraints and its relation with human agency (Chu et al. 2008; Jones et al. 2008) and that some clarifications are needed to that respect.

5.3. Agency within IT Structures

Research based on Giddens theory of structuration has a distinguished history in IS (Jones et al. 2008). Structuration theory takes the counterpoint of other sociological lenses, by positing

the mutual constitution of agency and structures. On the one hand, theorists such as Marx or Bourdieu offer a holistic perspective for understanding the society and suggest that the individual is determined by social structures. On the other hand, theorists like Weber, the founder of the methodological individualism stream, argue that individuals' enactments originate social structures. By positing that the individual, action and social structure all interact together, the perspective of Giddens somewhat reconciles these contradictory views and emphasizes their complementarities. Emphasizing *structuration*, Giddens views structures in movement rather than as having stable, regular properties that can be portrayed and/or predicted by laws (Jones et al. 2008).

A way of analyzing interactions between IT and organizations is notably provided by Orlikowski (1992). In order to tackle this issue, and in response to problems found in prior conceptualizations, Orlikowski (1992) advances the *structurational model of technology* based on Giddens' (1984) theory of structuration. In this theory, Orlikowski (1992) set forth three modalities of structuration. These modalities are interpretive schemes, resources, and norms. Consistent with structuration theory (Giddens 1984), system users are viewed as constrained as well as enabled by the IT artifact – that embeds structure –, which is the result of previous actions (Orlikowski 1992). Given these properties of IT, we need to understand how middle managers interpret IT constraints and enact strategic behaviors related to IT.

Two key elements constitute the structurational model of technology: the duality of structure, and the interpretive flexibility of technology. The *duality of structure* refers to the fact that the technology is the product of human action, and that certain patterns of use of the technology become institutionalized and constitute the structure. The *interpretive flexibility of technology* draws from the separation of the actions that constitute the technology and the action that the technology constitutes. It refers to "the degree to which users of a technology are engaged in

its constitution (physically and/or socially) during development and use" (p. 409). Hence, social actors enactments are likely to occur within the limitations posed by constraints embedded in the IT artifact.

In spite of its interest for understanding the interactions between IT and organizations, the structurational model of technology is not without its own difficulties. Indeed, this model considers social structures are embedded in technology, which violates the original perspective of Giddens (1984) on the mutual constitution of social facts and structures (e.g., De Vaujany 2003; Godé-Sanchez 2008; Groleau 2000; Orlikowski 2000). As argued by Jones and Karsten (2008):

> Structure, as defined by Giddens, cannot be inscribed or embedded in technology, since to do so would be equivalent to give it an existence separate from the practices of social actors and independent of action, thereby turning the duality, which is such a central feature of Giddens's position, into a dualism (p. 6).

In a second stance, Orlikowski (2000) proposed the *practice lens* in order to understand specifically user enactments of structures. In this perspective, instead of seeing the IT artifact as being the structure, the researcher considers what makes the structure is user recurrent enactments of IT. In this research Orlikowski (2000) attempted going beyond prior conceptualizations such as the structurational model of technology (Orlikowski 1992) and adaptative structuration theory (DeSanctis 1994), which views structures as being embodied in the IT artifact. Orlikowski (2000) identified two major problems in these conceptualizations. The first one is the postulate the IT becomes stabilized after their development. The researcher argues that empirical evidence suggest that IT are not static and evolve over time, and that their properties can be modified by users. The second one is the postulate that social structures are embodied in the IT. Conversely, Orlikowski argues that this position is not consistent with the postulate of Giddens that the IT has no material existence. In the practice perspective, instead, Orlikowski (2000, p. 406) views the structure

as the "set of rules and resources instantiated in recurrent social practice". The researcher further argues that "while a technology can be seen to embody particular symbol and material properties, it does not embody structures because those are only instantiated in practice" (Orlikowski 2000, p. 406). This perspective thus favors a view of IT as *dynamic* and which use is *situated* in practice. It views the IT as closely linked to human agency through a recursive relation. Indeed, it considers that in using IT, individuals shape the structure that will in turn determine their uses.

The practice perspective of Orlikowski (2000) has been shown to be a relevant approach, including with such constraining technologies as ERP systems (Boudreau et al. 2005). Unfortunately, as suggested by Chu and Robey (2008), this perspective still does not allow to fully understand "how and why actors use technology" (p. 16). Though, we believe the perspectives offered by both the structurational model of technology and the practice perspective still offer a relevant conceptualization of IT. However, key issues regarding the relation between agency and structures remain unresolved. Indeed, although agency is central in IS structuration research, researchers, overall, provided little theorization about how human agency occurs within around IT (Chu and Robey 2008; Jones and Karsten 2008). According to Jones and Karsten (2008):

> Structural research has, arguably, paid insufficient attention to the continuous operation of agency, the mutuality of constitution, or its pervasiveness. Thus the persistence of agency would suggest that IS researchers need to be sensitive to actor's roles in sustaining and modifying settings, perhaps especially in those that are considered to be unchanging (and, perhaps, unchangeable) (Jones et al. 2008, p. 25).

Especially, some applications of the structurational model of technology may fail to explain the social, cognitive and contextual motives of human action, which are seen in an "unproblematic light" (Thompson 2004, p. 11). Jones and Karsten (2008) argue that elements of agency and structure should be taken simultaneously into account instead of one at a time.

> The intrinsic interconnection between social actors and social institutions suggests that researchers need to pay equal attention to how individuals contribute to organizational and social power relationships, norms, and meanings, and to how individual practices are shaped by these, rather than privileging one or the other or focusing only on those structures most immediately evident in the specific setting" (Jones et al. 2008, p. 25)

In fact, Leonardi and Barley (2008) argue that researchers are sometimes confuse in distinguishing the material from the social and the determinism from the voluntarism.

Overall, these concerns suggest that, so far, IS structuration research offers an interesting but incomplete understanding of the relations between agency and structure. For all these reasons, it is necessary to reintegrate accounts of human agency and motivation for action in conceptualizations aiming at understanding IT structuration.

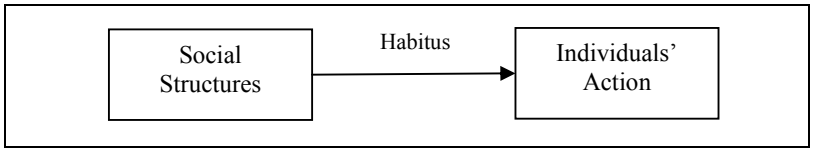
5.4. Why Do Social Actors Accept Structural Constraints?

Researchers have long debated about the role of structural constraints in individuals' enactments. Structuration theory of Giddens (1984) as well as strategic actor theory (Crozier et al. 1977) have a fundamental postulate that individuals are never completely constrained and have margins of liberty in the workplace. Agency is indeed fundamentally voluntaristic (Jones et al. 2008). Of course, social actors, do not always have the possibility to influence features and functionalities of the IT (Crozier 1983; Vaujany 2005). Though, it is still possible that social actors interact with IT artifacts with unintended patterns of usage (DeSanctis 1994; Orlikowski 2000), even when the IT is not a flexible one (Boudreau et al. 2005).

The issue of understanding why social actors accept structural constraints can be approached through several lenses. For example, Bourdieu, posits that social structures determine individuals' action. Individuals reproduce practices that are relevant to their social group according to a socially internalized *habitus*. It is posited that structural constraints and

structures of domination, which are crystallized in *habitus.* The *habitus* indeed consists in the unconscious representations and practices reproduced by homogeneous groups of individuals (Bourdieu 1980). Bourdieu thus offers a holistic view of individual behaviors, explaining behaviors as predetermined by social structures and logics of domination. He insists on the predetermined aspects of practice through a structural perspective. Figure 5.1 illustrates this perspective.

Figure 5-1. A Structuralist Perspective of Human Action



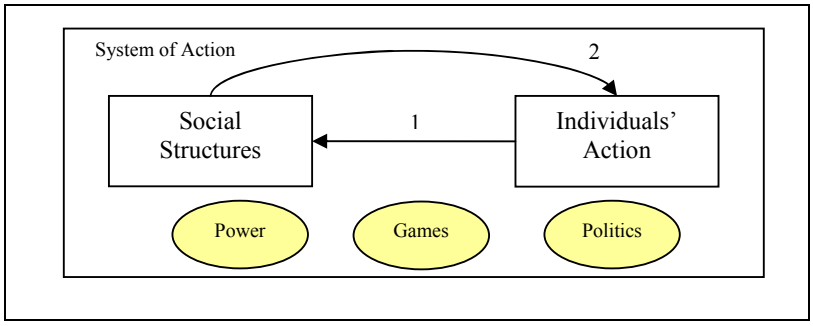
Differently, Crozier and Friedberg (1977), tenants of the methodological individualism (Boudon 1973; Weber 1949), suggest that social actors negotiate their engagement with their organization with a conceptualization of structures as games. Crozier and Friedberg (1977) claim to go beyond the determinism of structural approaches such as that, for example, of Bourdieu. Their argument is that by positing that individuals have predetermined behavior and are conditioned by social structures, a structuralist perspective such as that of Bourdieu fells short in explaining social change and learning.

According to Crozier and Friedberg (1977), social actors play games with bounded rationality in the course of their interactions with others within their organization. They argue that social actors always have some freedom that they can exercise in organizations. These researchers posit that social structures are made by social actors' interactions with one another and are made of games played in *concrete systems of action* the researchers defined as:

> "A structured human ensemble which employs relatively stable game mechanisms to coordinate the actions of its participants. It furthermore maintains its structure, i.e., the stability of its games and the relationships among them, by means of mechanisms of regulation. These, in turn, form the content of still other games" (p.153)

Thus, social actors' behavior is mostly undetermined and should primarily be analyzed by examining their own objectives and interests. Figure 5.2 illustrates this perspective.

Figure 5-2. The Strategic Perspective of Human Action



In strategic actor theory, social actors' behavior is fundamentally strategic. They accept to comply with structural constraints *because* this can allow them being enabled in other respects and mastering uncertainty. In contrast, the researchers argue that while social actors can accept the objectives of social change, they can refuse to promote it if this involves losing what is important for them in the workplace (Crozier et al. 1977).

Crozier and Friedberg (1977) further suggest that actors' behavior is fundamentally contingent to their context of action. Organizations are viewed as environments whereby multiple rationalities and objectives are sometimes opposed and confront together. According to Crozier and Friedberg (1977) each actor negotiates his engagement with his organization depending on his own objectives. Yet, a fundamental issue to understand and to which the researchers try to answer, is that of the nature of regulatory mechanisms that allow the integration of power relationship in the course of individuals' activities (p. 95). This is all the more important to understand as power relationships and politics in the workplace may be linked to IT implementation failure or malfunction (Levine et al. 1995; Markus 1983).

An initial premise of Crozier and Friedberg (1977) for understanding the role of formal structure is that "an actor can exert power over others and 'manipulate them at his profit, only

by accepting to be 'manipulated' in turn and by letting them exert power on him / her" (p. 104). According to the researchers, it is only by satisfying partially to the expectations of other people that these people become a constraint for the individual (p. 106). This is why rules are constraining for an individual. Constraints do not apply to pre-determined behaviors, but rather to a range of strategies potentially enacted by individuals (p. 115). This is consistent to structuration theory, although there is some controversy on this issue (Jones et al. 2008).

The rules of the game in an organization are based on the uncertainty of its sustainability and survival. Thus, as long as social actors want to continue to play, they must accept to comply with rules (Crozier et al. 1977). The researchers argue that the uncertainty with respect to the possibility of survival of the organization provides power to top managers or company owners, who are supposed to have knowledge about these parameters. But as well as in Giddens' view, there is a duality of structure whereby 1) all people within the organization, including top managers must comply with structural constraints and 2) structural constraints emanate from prior power relationships and bargaining (p. 107). According to Crozier and Friedberg (1977), the structures and rules of the game are "provisional, always contingent institutionalizations of the solution to the problem of cooperation among relatively free actors. This solution is given by the actors themselves, in light of the constraints, resources, and negotiating capacities of the moment. As such, rules and structures are neither neutral nor uncontested" (p. 52).

Crozier and Friedberg (1977) thus base their conceptualization on the concept of game. They consider the game is an instrument used by social actors and allows reconciling freedom and constraints (p. 113). The game is "a concrete mechanism which men use to structure and regularize their power relations, while leaving these relations – and themselves – free" (p.

113). They argue that organizational structures are made of games, which are what defines winning and loss possibilities for social actors.

In sum, why constraints are accepted is, according to Crozier and Friedberg (1977), because these constraints are made of games framing a range of winning strategies. If social actors want to win and continue their engagement with their organization, they must elaborate such winning strategies. Thus, actors are not totally free because they must negotiate and adopt a winning scenario, which implies that in order to win in some areas, they must accept to loose in some other areas (Crozier et al. 1977). Actors are not totally constrained also because they master sources of uncertainty arising notably from their knowledge and use of the technology in their daily tasks. As argued by Crozier and Friedberg (1977):

> The player remains free but must, if he wants to win, adopt a rational strategy which conforms to the nature of the game, whose rules he must respect. This means that to further his interests, he must accept the constraints imposed to him (p. 56).

Thus, the way actors will use and behave with respect to IT will be related to the rules of the game that prevail in their concrete system of action. Change is the "transformation of a system of action" (Crozier et al. 1977, p. 383). Actors may view change negatively if it is likely to involve loss of power and increased uncertainty. Conversely, an actor can find opportunities to reinforce his/her power, acquiring new capabilities in the change process (Beaudry and Pinsonneault 2005; Boudreau and Robey 2005; Joshi 1991; Vaast and Walsham 2005), and thus be more in favor of change.

Crozier and Friedberg (1977) conceive of change is that of a process of *learning* of new forms of collective action, which, when applied to IT, could be seen to be similar to the *improvised learning* process depicted by Boudreau and Robey (2005). And for change to be successful, it should result from a process whereby the resources and capabilities of participants are collectively mobilized or created for shaping new games (Crozier et al. 1977, p.221). In this

process, we argue, middle managers play a major role, both as social actors and as change facilitators.

The perspective of the strategic actor theory (Crozier et al. 1977) thus offers further insights as compared to pure rational theories. This theory is particularly useful for gaining deeper insights in how and why social actors accept constraints, and, subsequently, why they accept change. This concern is an important one in structurational research based on Giddens (Jones et al. 2008). The concepts of game and of system of action can probably help explain why uniform outcomes may sometimes result from IT in contexts characterized by human agency and with no "deterministic materialism" (Leonardi et al. 2008). No definitive answers however, have been provided to these issues.

Crozier and Friedberg (1977) offer a balanced conceptualization where social actors' strategies and the need to comply with constraints are taken into account. This perspective further allows envisaging the organizational change process. In this process, "humans need to put in practice new human relationships, new forms of social control" (p. 383). They have in fact to gain knowledge of new types of games. Also, they must be able estimate accurately the risks posed by any change on them (Crozier et al. 1977). The strategic perspective of Crozier and Friedberg and the practice perspective of Bourdieu are depicted in Table 5.2 below.

Table 5.2. Two Perspectives on Social Actors Acceptance of Structural Constraints

Authors	Approach	Key Concepts	Focus	Social Constraints
Crozier and Friedberg (1977)	Strategic Perspective	Strategy, power, politics	Social actors' strategic behavior	Accepted for their capacity to provide advantages to social actors and to allow them to participate in "winning" scenarios for action.
Bourdieu	Practice Perspective	Habitus, structures of domination	Social actors' reproduction of practices	Accepted in ways predetermined by social status and past practices.

In spite of the strengths of the approach of Crozier and Friedberg (1977), researchers argue, it neglects some important aspects of human agency. Strategic actor theory has for example

been criticized for its over estimation of actors freedom and independence (Dion 1982). According to Dion (1982), this approach, that has been shown to apply well in very structured organizational contexts such as the French public administration (the field where the theory has initially been developed), might not apply in less structured and more open contexts. The researcher argues that when "lived finalities" lie in predetermined choices or to other reasons, this theory hardly allows to understand human behaviors (Dion 1982, p. 98). Thus, the strategic analysis of Crozier and Friedberg may sometimes fail to offer satisfying explanations of individuals' behavior in the workplace, given the multiple factors independent from organizational contingencies that are linked with actors' objectives (Dion 1982). The argument of Crozier and Friedberg (1977) that actors' behavior can be explained by their strategic behavior exercised in their system of action is thus not always theoretically acceptable (Dion 1982). Instead, as argued by Thompson (2004):

> Social agency is conditioned not just by the way in which people exploit ready-at-hand allocative facilities, rooted in social structures of domination, but also by the nature of reflexive, embodied awareness which each individual brings to, and which they interpret, their every social encounter" (p. 19).

According to Thompson (2004), not only social structures but also factors "within the biographical realm" (p. 24) influence human behavior in organizations. Following this perspective, and intending to deal with this problem in prior research, De Vaujany (2008) calls, for example, for a reintegration of reflexivity in studying the motives for human action with IT. In fact, Crozier and Friedberg (1977) do envisage reflexivity in individual behaviors. However, by probably overly emphasizing the "strategic" aspect of human agency, the researchers may fail to offer a comprehensive view of human action.

These limitations in the strategic actor theory call for further refinements. The perspective of Bourdieu can be seen as oriented toward the past, notably through the habitus and past practices. The perspective of Crozier and Friedberg (1977), instead, can be viewed as giving

more importance to individual projections in the future and actions in the present, while somewhat neglecting the role of past practices in human agency. The limitations of such approaches make it necessary to integrate more in-depth temporal perspectives in human action, while still further investigating the motives for human action within social structures in the present. We believe a human agency approach (Emirbayer et al. 1998) can help improving the examination of social actors' ways of responding to change by reconciling one sided temporal perspectives. Especially, as depicted in Figure 5.3 below, the temporal theory of human agency (Emirbayer et al. 1998) has proven to be a useful lens to understand change in practice with the implementation of disruptive IT innovation in prior research (Boudreau et al. 2005; Chu et al. 2008; Cousins et al. 2005).

Table 5.3. Social Actors' Behaviors

Past	Present	Future
Habitus [1] (Bourdieu)		
	Strategic Perspective [2] (Crozier and Friedberg 1977)	
Temporal Theory of Human Agency [3] (Emirbayer and Mische 1998)		

[1] The *strategic* perspective emphasizes social actor strategic orientation and rational anticipations.
[2] The *habitus* emphasizes reproduction of practice and the predetermined aspect of individual behavior.
[3] The *temporal* perspective emphasizes the temporality of human agency integrating fragmentary perspectives.

5.5. The Temporal Perspective of Human Agency

In accordance with Emirbayer and Mische (1998), the preceding discussion suggests that conceptualizations of human agency in social research appear fragmentary and often incomplete (Emirbayer et al. 1998). Emirbayer and Mische (1998) contend that researchers often offered one-sided conceptualizations of human agency. Among these conceptualizations, there are practice approaches, which focus on user past experiences and routines. According to Emirbayer and Mische (1998), this category encompasses research approaches of for example Bourdieu (1972; 1980) and Giddens (1984). Bourdieu explains human action through habitus, which consists in internalized schemes of thought and its

resulting practices. This conceptualization emphasizes the importance of social structures that determine human action. Other conceptualizations, drawing for example on rational choice theories, emphasize on actors' rational behavior and relative freedom of purposive action. By positing individual behavior overly in "strategic" terms, strategic actor theory (Crozier et al. 1977) may also fail to understand the role of past practices in human agency.

Going beyond these dichotomies, Emirbayer and Mische (1998), offer a synthesizing conceptualization of human agency emphasizing actors' temporal orientations. According to these researchers "the structural contexts of action are themselves temporal as well as relational fields – multiple, overlapping ways of ordering time toward which social actors can assume different simultaneous agentic orientations" (Emirbayer et al. 1998, p. 964). Their attempt has been to subdivide human agency into temporal elements. They argue this temporal view of agency is relevant because it helps taking into account the flow of time that helps grasping and understanding the complexity of social action. According to them, "the structural contexts of action are themselves temporal as well as relational fields – multiple, overlapping ways of ordering time toward which social actors can assume different simultaneous agentic orientations" (Emirbayer et al. 1998, p. 964). Accordingly, they propose conceptualizing agency as a temporally oriented process, comprising orientations toward the past – the iterational element, but also toward the present – the practical evaluative element, and the future – the projective element. These dimensions are described hereafter.

The *iterational element* of agency is, according to Emirbayer and Mische (1998), the one that received most attention in prior research. This element refers to work routines and habits as incorporated into practices and contributing to the stability of "social universes" (Emirbayer et al. 1998, p. 971). It has been studied by IS researchers for explaining inertia, notably inertia of practice (Boudreau et al. 2005; Chu et al. 2008).

Projectivity is the second element of human agency. Projectivity is made of social actors' positives expectations but also their fears and desires for the future (Emirbayer et al. 1998). Prior research related projectivity to individuals willing to change and exploit the benefits offered by an IT or their fear of change due to specific expectations about the future (Boudreau et al. 2005; Chu et al. 2008).

Finally, the *practical evaluative element* of Emirbayer and Mische (1998) relates to people's orientation toward the present. The researchers related the practical evaluative dimension to social actors' responses to "emerging demands, dilemmas, and ambiguities of presently evolving situations" (Emirbayer et al. 1998, p. 971). In dealing with the practical evaluative element, researchers dealt with how individuals respond to practical problems and challenges arising from the present (Boudreau et al. 2005; Chu et al. 2008).

The temporal theory of human agency has been criticized for neglecting the role of structures in human agency (Chu et al. 2008; Fuchs 2001). Furthermore, it provides no guidance on the role of IT in human agency. Arguably, human agency theory and accounts about the role structure in strategic actor theory are complementary. Hence, we decided to combine these two theories in studying human agency and middle-managers responses to structural constraints in e-Gov.

5.6. Understanding Middle Managers Responses to e-Government

Improving the management of public finance is among the key objectives of the French public administration modernization. In the same time, there are needs to measuring the performance of decisions made. These measures are set in part in order to increase transparency through the diminution of information asymmetry between elected politicians and civil servants who

perform operations in the administration (Arkwright et al. 2007). This need for transparency is all the more important since tax collected are often said to be too high with, for example, following INSEE, 43% of the GPA in France in 2007. New governance rules and indicators are thus set in order to achieve these objectives. For that, middle-managers are clearly identified as key actors fostering the success of the new orientations.

While implementing IT and conducting change, public administrations face important organizational and human challenges. These organizations have long been considered as bureaucracies, organizations governed by strongly structured work procedures (Crozier 1964). Accordingly, public middle-managers' work is usually believed to be very structured with formal rules and procedures (Crozier 1964). Though, nowadays, they have to make decisions in increasingly uncertain environments. However, little do we know about how they make these decisions and the role IT plays in their enactments in public administration.

Local public administrations are made of multiple, distributed units, which aim to respond to local citizen and stockholders' needs (e.g., city halls, hospitals, local collectivities). Such units are often characterized by a large distance between top and middle managers. To that respect, Balogun and Johnson (2004) found in their study that "especially in geographically dispersed organizations, senior managers became 'ghosts' in the sensemaking of middle-managers, rather than being active directors of change" (p. 524). Middle managers thus have to interpret top management initiatives and to contribute to projects in which they have not always been involved. Because of their particular position and roles, however, middle-managers probably have more margin of liberty in the workplace than regular public sector agents and may not be totally determined by rules and procedures.

Furthermore, change also implies that actors have to insert in new forms of social control and regulation, and to learn new types of games (Crozier et al. 1977). These games and resulting

consequences within units are likely to influence the IT implementation process, as well as post-implementation phases. Thus, studying human agency as exerted by middle managers is important for a good understanding of the success or failure of e-government initiatives.

5.7. Methods

5.7.1. Research Design

Case studies are recommended for an in-depth understanding of a phenomenon, and when several sources are necessary in order to investigate it (Miles et al. 1994; Yin 1994). We conducted a single interpretive case in a large, French public administration, BETA. Within case designs are appropriate for describing and explaining a phenomenon in a given social context (Miles et al. 1994).

The case deals with the introduction of BSYS, an integrated, mandatory use system, BSYS, across the 33 000 local units of BETA. Local units are in charge of recovering tax revenue, paying third parties' suppliers, checking public spending, and delivering financial and accounting advice to third parties. BSYS is a public accountancy system which mainly aimed at 1) improving the rigor and effectiveness of local public accountancy processes, 2) Improving service delivery and providing new ones to local external stakeholders, and 3) providing local units' managers with advanced decision aids. As such, BSYS was expected to strongly structure work within local units.

We investigated how managers of these local units of BETA interpreted change and contributed to the implementation of BSYS while exerting human agency. BETA research setting was appropriate because it allowed gathering data about their fears and hopes around

BSYS and the ongoing steps they were taking in order to respond to practical needs emerging following its implementation.

In our research approach, we followed the guidelines provided by Klein and Myers (1999). Accordingly, our primary data source was made of social constructions, and especially of middle managers' perceptions, interpretations, meanings and shared meanings (Klein et al. 1999; Mason 2002). Interpretive research indeed looks for reality in complex social interactions and from actors' own point of views (Klein et al. 1999). It assumes that "our knowledge of reality is gained only through social constructions such as language, consciousness, shared meanings, documents, tools, and other artifacts" (Klein et al. 1999, p. 69). We thus focused on middle managers' own points of views (Klein et al. 1999). Our approach is emergent in that we consider that "the uses and consequences of IT emerge unpredictably from complex social interactions" (Markus et al. 1988, p. 588). Details about our application of Klein and Myers' guidelines are given in Appendix.

In this research, unit managers were considered as social actors, or as "an organization member representing the interests of the organization or subunit (and her own interests) in the exchange of various forms of capital, and who uses ICTs to facilitate these exchanges and to service these affiliations" (Lamb et al. 2003, p. 212).

5.7.2. Data Collection

Qualitative interviewing was legitimate for several reasons. Our ontological position considerers individuals views and perceptions as relevant for social reality for answering our research questions (Mason 2002). Also, our epistemological assumptions and that that knowledge is situational and contextual both fit well with qualitative interviewing. Our research material was thus gathered through semi-structured interviews. Data were collected during the summer 2007. In total, fifteen semi-structured interviews of 50 – 120 minutes in

length were conducted with local unit managers from two French departments. All interviews with unit managers were recorded and fully transcribed, and confidentiality warranted.

Sampling was both theoretical and organic. It was theoretical in that we selected participants based on their relevance with respect to our research purpose (Mason 2002). It was also organic in that we furthered interviews when necessary in order to get additional insights about middle managers sensemaking in LAUs, and about the human context of action surrounding the implementation of Bsys. Middle-managers were the key target of our inquiry. However, we felt important to interview other relevant categories of individuals such as Bsys tutors who accompanied BSYS change in the selected local units, agents from middle-managers' staff, and managers from the headquarters who could inform about the practical implications of BSYS and middle-managers work context.

For that, additionally, interviews were conducted with the BSYS' project manager (x1), BSYS tutors (x 4, including one interview with 2 tutors), local unit coordinators in the headquarters (x 2), and former local unit managers (x 2). These interviews helped gaining better knowledge about managerial work in unit, but also about the stakes of the project for its various stakeholders. In order to better locate the project within broader changes occurring in the public administration, we also interviewed top managers at governmental level (x 3). These interviews, which were conducted before those with local unit managers helped contextualizing the current challenges of IT implementations in the French public administration. Further, a six-month, two days a week on average, non participant observation in the headquarters of BETA allowed to get immersed in the public administration context. This helped understanding the organizational culture of BETA. These interviews were tape-recorded and fully transcribed. In addition, we conducted informal interviews with both unit

managers and agents in order to gain additional knowledge about the social context of action of unit managers.

In all units but one local unit, BSYS was yet implemented. In the unit where BSYS was not yet implemented, it had to be implemented soon and the unit was in active phase of preparation for its deployment. Further, the manager of this unit had the opportunity to use BSYS and to contribute to its implementation in a previous unit manager position in another local unit. For that, we kept this interview in analyses. Together, all the interviews with all these actors allowed us being better aware of the challenges faced by local units and their managers. Details about sampling are given in Table 5.4 below.

Table 5.4. Description of Sampling

Respondent	Purpose	Number
Core Interviews		
Managers of local units	Capturing human agency in public middle-managers.	15
Key Informants		
Project Manager	Understanding the challenges posed by BSYS and managerial expectations for BETA.	1
BSYS tutors	Understanding the context of implementation of BSYS in the local units investigated.	5
Local units management in the headquarters	Understanding the practical challenges of BSYS for the headquarters.	2
Former managers of local units	Understanding the context of managerial action, practical needs, and work principles in local units.	2
Top Manager at governmental level	Understanding the corporate challenges of the implementation of large e-Government projects in the public sector.	3
	Total	***28***

The interview protocol for local unit managers contained questions about their professional and educational backgrounds, about their overall thinking and feeling about BSYS in local units, and more precise questions aimed at capturing unit managers' temporal orientations. Managers had the possibility to add further information at their convenience at the end of the interview. Questions aimed at capturing temporal orientations dealt with established routines of unit managers, their practical emerging responses to dilemmas and unexpected situations, as well as their fears and positive expectations for the future (Chu et al. 2008; Emirbayer et al.

1998). Our attempt was to identify events whereby managers responded not being predetermined by social structures, though to identify human agency (Chu et al. 2008) in middle-managers enactments. Questionnaire items examples are given in Table 5.5 below.

Table 5.5. Protocol for Data Collection

Dimensions	**Working Definition**
Iterational Element	Focus on agency in habitual, routinized activities in relation with the tasks performed with and around the system. *Example question:* Can you tell me about how work was performed prior to BSYS implementation? How far does BSYS modify your work?
Projective Element	Expectations and anticipatory action in relation with the technology. It refers to actors orientations given expectations about the technology. *Example Question*: What are your expectations with respect to BSYS?
Practical Evaluative Element	Focus on actors judgments about alternatives of actions with respect to the demands of the technology. *Example question:* What do you find special or different about BSYS, as compared with previous systems?
Technology	An instrument that regulates the conditions of human action and the possibility of games among actors. *Example question*: What helps you most in the system?

Although we had an interview guide for gathering data, our attempt to get situational knowledge about how managers responded to the implementation of BSYS led us to ask different questions across units. Indeed, for Mason (2002), for obtaining situated knowledge of the field, instead of asking the same questions to every respondent, it is often needed to ask different questions to respondents in order to gather data that are similar in many respects (Mason 2002).

5.8. Data Analysis

First, interview transcripts were read several times along with documents about the BSYS project and field notes. Data were confronted to several theoretical lenses during analysis

(Mason 2002). This is consistent with the dialogical reasoning principle of Klein and Myers (1999). Stakeholder theory (Freeman 1984), strategic actor theory (Crozier et al. 1977), the temporal theory of human agency (Emirbayer et al. 1998) were the main theories investigated. The temporal theory of human agency and strategic actor theory were found the most relevant ones.

Unit managers' interview transcripts were coded with NVIVO 2. We first used the a priori coding scheme from Chu and Robey (2008) for the temporal elements of human agency of Emirbayer and Mische (1998). The games in which middle managers are inserted emerged from data and aimed at providing a better understanding of practical evaluations. The games were attitudes that resulted from a bargaining of managers within their unit, with their agents, the headquarters, and the IT.

In order to answer the first research question, we thus identified how unit managers willing to benefit from BSYS would induce them to integrate its rules and principles into their work practices. According to Crozier and Friedberg (1977), issues regarding the technology that deserve explanations are to understand "on the one hand, why, how and to what extent the characteristics of the technology becomes constraining for social actors, and on the other hand, to what extent, they can play with these constraints" (p. 141). We sought to understand the extent to which unit managers had to integrate these rules and regulations in order to be able to respond to the challenge they face. In this, consistent with strategic actor theory (Crozier et al. 1977), we highlighted what made the *rules of the game* surrounding BSYS, and which was constraining for unit managers.

In order to answer the second research question, data were coded similar to Chu and Robey (2008). The iterational element focused on comfortable, established managerial routines within local units. The projective element focused on positive expectations and fears for the

future about BSYS. The practical evaluative element dealt with actions taken with respect to the IT, third parties, and agents, in making IT related decisions, with a particular emphasis on games and unit managers' rationality (Crozier et al. 1977). While this element has been the least theorized in social research according to Emirbayer and Mische (1998), strategic actor theory (Crozier et al. 1977) was thus found an appropriate lens to complement it. Especially, we sought to highlight that unit managers exercised some rationality in playing games (Crozier et al. 1977) when they responded to dilemmas linked with BSYS. Text fragment thus dealt with unit managers' strategizing around constraints and on their expectations about what the acceptance of these constraints would bring to them.

5.9. Results

5.9.1. Case Overview

Positions of local unit manager are coveted for the responsibilities and recognition they provide within BETA. These managers appreciate having direct relationships with elected-politicians (e.g. mayors) and with other top managers from non-governmental public administrations such as hospitals. They are used to work with a great deal of autonomy and control over their work. They have the responsibility of implementing the missions and enacting the new strategic orientations of BETA on the field. Local unit managers of BETA can thus be considered as middle-managers, consistent with the way most researchers define their role. Especially, they link top managers' strategic decisions to operations on the field (Balogun et al. 2004; Larsen 1993; e.g., Millman et al. 1987; Pinsonneault et al. 1993).

In their daily tasks, unit managers are responsible of ensuring an efficient management of accounting of local finance, and effective delivery of service to external stakeholders. In that, they also have a role of accounting and finance advisor to external stakeholders (e.g.,

hospitals, city halls, etc.). These managers had sometimes to use systems personally, but mainly for monitoring purposes, and in order to provide information to the headquarters and to external stakeholders. Most often, however, agents and adjunct directors were used to prepare reports that unit managers analyzed and interpreted before sending it to their correspondents in headquarters.

As an integrated system, BSYS aimed at replacing several local public sector legacy systems. In that, unit managers were considered to be responsible of the success of the implementation of Bsys in their unit. They had to foster the best possible conditions in order to facilitate its implementation. Legacy systems were, for some of them, more than 20 years old. These systems had a poor design and user-friendliness. Although these IS were flexible in use, they were considered not to be appropriate for responding to the new challenges faced by BETA. In contrast, BSYS was to enforce rigorously the law and accounting principle, which also included increased transparency in local units for the headquarters and an overall decrease of autonomy of unit managers. Unit managers were personally responsible on their own funds of any problem that would happen in their unit. Also, they were concerned that the systems they used were antiquated and not suited for a modern management of local finance. For these reasons, the changes induced by BSYS would appear, overall, even more appealing for them.

BSYS aimed at providing both a dependable system for effectively managing local public accounts, and a system that would help offering new services of better quality to third parties.

> There are huge expectations from modernization of means of payment, and BSYS allows proposing all these new moderns means of payment. This is the key point; it makes things more exciting while everything was still. Well…previously, we did not feel them so much interested in new means of payment, while now they all want to benefit from direct debit, they all want the debit card. We could use these means of payment with Xsys (one of most recent ‘old generation’ system), but implementing BSYS has boosted all this.

These third parties were considered as *customers* of the public administration by the project manager. This reflects his managerial approach and the importance placed by top management in satisfying these organizations. More generally, it reflects the overall objectives of the new system within the frame of the modernization of public sector:

> With respect to the local public sector, collectivities are our clients. I always employ the word "client", and I am not the only one to do that, because our clients expect much from us. I first serve my clients. I am not the one who decides.

Thus, BSYS was heavily user and customer-oriented and stemmed from a service-oriented vision. Unit managers had to espouse the new culture conveyed by BSYS and to make their subordinates understand it. They showed enthusiasm with respect to BSYS, and mostly adhered to its underlying rules and principles. They were convinced that BSYS was the necessary tool to increase the quality of public accountancy, and that it would foster the modernization of public administration. According to a unit manager:

> We have this objective of quality of accounting, of performance, of goals to reach, and, finally, there is always this « maybe one day we will go on to certify accounting ». It is a praiseworthy, ambitious objective, but it passes by the fact that we need to unify procedures, to unify behaviors, etc. and that the erring ways of doing things of the past cannot last any more.

The project manager of BSYS considered that one of the key points in IT change success was to ensure appropriate communication about the project. He claimed to clearly foster a user-oriented vision during the development of the system.

> We build a new application that is aimed at final users. These users are not primarily middle-managers but their agents. This means that what I expect from middle-managers is that they relay messages to their agents. For that, I move in local units, it is a way for me to show them what they should do without asking them to do it.

Contrary to legacy systems, BSYS had embedded several new internal control procedures following the institutional willing to promote internal control and an efficient use of public funds. For example, BSYS users had personal login and password, which made computer

processes traceable, while a unique login and password was required in the previous system for the whole local unit. With BSYS, any operation made by any agent could thus be tracked, and authorizations were mandatory for making any changes or corrections. However, while these control procedures were a key feature of BSYS, it appeared in practice that this feature was hardly integrated and sometimes not accepted by unit managers. Thus, notwhistanding their positive attitudes and acceptance of BSYS objectives, unit managers fostered practices that could appear, in some extents, contradictory as compared to the ITs' initial objective and to their initial reactions.

That is, the project manager clearly identified them as having the responsibility of explaining change to agents and to make it accepted in local units. A key question regarding unit managers guided his investigations in local units:

> Do middle-managers who are in charge of transmitting these messages and the good implementation of the application make this psychological work in their units?

In this context, it was critical to understand why these contradictions occurred, and to examine human agency as exercised by middle managers relation with the implementation of BSYS.

5.9.2. The Roles of IT

The implementation of BSYS responded to important institutional and macro-economic concerns linked with the efficiency of process management and the efficient delivery of high quality service by public administration. BSYS was perceived by unit managers as a means to successfully address the practical implications of these challenges they faced. For example, a manager explained that with previous systems, accountancy lacked rigor and that the systems and rules formerly applied did not allow a rigorous management of local finance. This was considered as inappropriate with respect to the new orientations of public administration.

> We held accounting in a ways such as it worth what it worth and then, whatever were the conditions, we managed to buckle the accounting. And if we apply the current canvas in terms of performance, of objectives, of objectives of results, etc., it sticks in no way.

Furthermore, it was of an increasing importance for unit managers to provide reliable information in an efficient way. Their credibility was at stake in the evolving context, and they felt they needed to strengthen their legitimacy to external stakeholders.

> We have an obligation of accounting quality, and, mainly, of rapidity of information and management from day to day of the unit such as, it would not be acceptable for us not to process rapidly and efficiently our business with [a third party], following the implementation of BSYS, in order to allow them not to lose money.

For that, BSYS could be considered to be constraining in that those who wanted to beneficiate from its features – or to decrease the risks and uncertainty posed by legacy systems and procedures – had in turn to integrate this system into their work practices. Furthermore, complying with accounting quality procedures was seen of paramount importance, not only at the level of BETA, but also at the level of the whole French public administration. Therefore, the need to face these challenges made BSYS constraining in that, at this time, it was the most relevant system to allow it. In other words, unit managers could face these challenges only by accepting to implement BSYS in the most practically acceptable way.

That is, BSYS constraints were not neutral in unit managers felt it did not have the same implications in units depending on a number of factors. These factors included unit sizes but also established routines and traditions, for example. Thus, they believed BSYS was designed and was more convenient for units with certain characteristics that their unit did not necessarily have.

> I think that BSYS…the system would be ideal for a not so big collectivity, where people work in accurate manner, where third parties work in wonderful ways…now, its evident…sometimes you feel they designed BSYS for a small unit in its early beginnings, one that has no history…

The way unit managers evaluated their difficulties to cope with BSYS was also dependent upon how third parties were used to work. For example, some third parties were very small city halls with no implemented IT. Another unit manager said:

> In fact, each unit has its specificities, and we realize that we all do not always have the same problems. Because in fact, our problems are also linked with the ways of working of our third parties; we do not have the same third parties…

Other factors were perceived to be specific to units. For example, a manager explained some difficulties to comply with BSYS constraints following the merger of two units because of differences in compliance with rules and procedures across merging units.

> We merged two different units, and there were an important gap between the levels of accuracy of accounting across these units. That is to say that there was a unit that worked well, lets say very well, and another one that did not work well at all. Thus we had to struggle with collectivities to obtain some pieces of information, for us to have accounts that at least looked like something correct.

All this suggests that BSYS had different meaning and implications in units according to unit managers. Thus the adaptive efforts and mutual adaptation process in which they had to engage were not perceived to be equally demanding across units.

In spite of this relative acceptance of constraints, some managers were willing to increase the advantages they could gain with the system and their mastery of its rules and principle. Some managers indeed felt transparency and internal control were decreasing their autonomy and independence. More importantly, they felt they were more controlled than with legacy systems. A local unit manager related a poor acceptance of BSYS in his unit because of such concerns, with some suspicion about what were the real objectives of the headquarters with BSYS.

> They [the head office] have a more or less distant, more or less critic eye on what our staff does, I admit. But there is also a kind of internal control that is being put in place, and it is poorly accepted. Neither by middle-management nor by some agents.

However, BSYS also enabled them in several respects. For that, many managers interpreted this transparency in positive ways. In contrast to the preceding example, a manager explained that the transparency conveyed by BSYS would allow his unit providing services of better quality to third parties, and facilitating answering requests. For example, it was no longer necessary to make personalized answers to third parties' requests since these third parties could directly access the system. It was thus a way to dedicate time to other activities since all pertinent information about operations for third parties was available to them directly on BSYS.

> Moreover, this system can be visualized from the headquarters. This allows to put in place what we call a 'contemporaneous control' from services of local collectivities, who have, as well as we have, access to all the features that allow to see exactly what we do. We are transparent; we have different degrees to access information in real time. Thus, we are necessarily very good in terms of reactivity.

Differently, several managers explained that the new capabilities provided by BSYS would allow them to expect more support from the headquarters. A manager explained that the transparency provided by BSYS was a means to make the lack of resources within units more salient to the headquarters. Indeed, this manager expected that by seeing many mandates unprocessed, the headquarters would better acknowledge the lacks in human resources, either in terms of staffing, or in terms of training.

> I think that in any case, this transparency is rather positive, even though it makes complaining a little bit the accountants because there is a perception of being too much controlled. But it's quite positive because ultimately, the headquarters can better see staff problems: they see that our mandates remain unprocessed.

Another manager expressed a similar expectation, in considering increased transparency in BSYS as a means to gain more help in daily activities from the headquarters.

> Well, you know, what is being put in place is what we call 'contemporaneous control', because one must know that on BSYS, there are tools that deliver what we call controls of accounting anomalies that I can print, but that may

> also be seen directly by the local finance department in the headquarters. Thus, I consider that there may have supplementary help that can be provided to the unit by the headquarters.

Overall, thus, BSYS constraints stem from local unit managers' willing and opportunity to insert into a "winning scenario". In this "winning scenario", they integrate BSYS into their work practice and expect, in turn, to beneficiate from more system capabilities and from increased support from the headquarters. They also become key actors in the modernization of the public sector. Thus, such winning scenario includes accepting BSYS, which induces expectations of being enabled in turn. However, unit managers felt the implementation of BSYS had not the same implications depending on units' characteristics, the way they worked, and their third parties. BSYS was not accepted in all and for all, and unit managers attempted to master some uncertainty with the system, for example strategizing around the increased transparency. Thus, what resulted in constraints was neither neutral, nor uncontested (Crozier et al. 1977).

5.9.3. Human Agency

How can public middle-managers enactments following the implementation of BSYS be understood to the light of temporal components of human agency? As earlier mentioned, the temporal theory of human agency (Emirbayer et al. 1998) identifies orientation toward the past, the future, or the present as influencing action.

5.9.3.1. Iterational Agency

The iterational element reflects unit managers' routines and established practices. It helps explain how past routines and practices shape action in the present (Emirbayer et al. 1998).

Unit managers supervise agents who are the users of systems and usually have to explain and recall work procedures and principles, set priorities to agents, and guide them in responding to

exceptions. They also have an important monitoring and coordination activity. They, they can traditionally decide on the degree of autonomy they give to agents.

There was a learning period with BSYS, where unit managers had some difficulties to use it efficiently. In fact, they explained they attempted to use BSYS following the same rationale as that of legacy systems. However, because these were two different rationales, unit managers encountered some problems with BSYS in that they felt they could not easily use it well.

> Those who were accustomed to the rationale of Xsys (legacy system) still work with this rationale. And I am well informed when I say that because I did work very much by myself with Xsys and Ysys. I attended a training session, thus I had the Xsys schemata clear in mind….Which makes that ….that's true, I do not work on BSYS everyday, etc…however, I think now I know the problem well, my adjunct goes faster than I do. There are plenty of parameters, but I think that having known Xsys before somewhat impedes us…I would say that.

Although the old systems were not entirely satisfying, unit managers thus felt more comfortable with the rationale of these old systems. Debit and credits operations were directly acknowledged by system users, which made managers feel they had greater capability to integrate legacy systems into their work practices and make it suit their needs.

> When I did the accounting on Xsys, I had my debit account, and my credit account. I made the book entry. Now, I go on the screen, we know it will be taken here; it will go there without me to need to think about it. It is not my education. That's it. But one must not criticize BSYS too much. It will be a good system. It will become a good system. But I think we will loose some things also. But if it is perfect, it is no longer needed to think.

While doing efforts in order to better understand the underlying rationale of BSYS, unit managers felt this system resulted in some opacity. They were accustomed to using systems that were flexible; they felt they lost control of processes with BSYS.

> You feel you do not know well what happens. Well, you have a poor mastery…You feel you have a weaker mastery. You feel you do not understand what happens. Well, I think that accounting is being done

> accurately with BSYS…But, well…Sometimes you have some unexpected outcomes…, we wonder what happens….

What in fact was considered as a lack of flexibility was often due to the internal control principles embedded in BSYS. It resulted in new rules and procedures that unit managers had to comply with and to enforce. For example, although this was not always seen in bad eyes in the principle, a manager explained that payment rejects would not be recorded in previous systems, while all operations are recorded in BSYS:

> Well, before, here, the rejected mandate were not recorded, which means we transmitted the sheet of paper notifying the reject to the city hall, and the city hall cancelled the mandate. We first took in charge the mandate and the city hall cancelled it. While now with BSYS, it is no longer possible because it is not envisaged by the regulations. The regulations say we must make an accounting rejection.

The fact is that having to appropriate the new system was also perceived as very demanding by managers. BSYS induced more rigor and attention in that managers needed to be much more cautious in complying well with procedures than they needed with previous systems. For that, as compared to the latter, a manager explained he felt BSYS procedures were so difficult to appropriate that he felt tired at the end of the day:

> That's true that one must think about what he does, and I feel it myself, when I work with BSYS, things are not as systematic as it is with Xsys, you must be careful for everything and it makes you tired. Well, although colors are nice, however, you need to browse your screen, and honestly, at the end of the day, when one has worked with BSYS, one can do nothing else, it is really exhausting. Maybe less for young people, but women around 50 years old to 60 years old suffer a lot…

These difficulties to integrate BSYS into work practices were also reflected in how unit managers perceived the language and vocabulary used in the system. In that, they felt it difficult to learn the new language in BSYS. This language was perceived to be different not only from previous systems, but also from their own verbal codes and language in local units.

> BSYS, it's a language that is totally different from what we had previously. Yet, when you have an answer on BSYS, you have first to overcode it because they do not speak [those who designed BSYS] like we do.

Unit managers felt it very useful and appreciable to be able to respond with a great deal of autonomy to problems as they arose. They also liked having the possibility to develop their own solutions to respond to these problems. For example, a manager reported the use of facilitating tools he developed with the Excel software in order to help agents. Although he had to validate such tools used in units, he appreciated the fact of having the possibility to make useful use of other system that would help managing units.

> That's why I tell you Excel is great, it's because you can do plenty of things. But it was a personal help for doing simulations. But now there is one that is official, that has been declared official by the headquarters….Well, I wrote this that time, I enjoyed spending some evenings to do it…everything is automatic. It gives commentaries, it says many things.

They appreciated this possibility they had to develop their own solution to emerging problems or to facilitate daily work. Unit managers also made their own arrangements with their third parties, and with agents. They found a great comfort with the capacity they had to resolve problems and tackle dilemmas by themselves.

> I expected a more systematic management, I mean, like what we had in Xsys [one of the legacy systems]. That's true that we made some mistakes, but we had systems,…for repetitive processes, we managed to do it thus…I don't know…on the keyboard, F1 was sufficient for changing the sum and we had the whole operations that appeared instantaneously. While now, you need to change the data entry form each time…it's too long! There is no simplification in data entry, on the contrary…

In practice, unit managers could also decide on agents' degree of specialization or polyvalence. Legacy systems had neither authentication nor traceability features and errors were corrected by agents or by unit managers without history. Although unit managers expressed concerns that this way of functioning involved too many risks for their unit with much trust-based control, they valued the freedom and control they personally had over their work.

> Maybe we had a better mastery, but it was more accounting (he previous systems), I mean, we knew what was debited, what was credited, we managed to do it. Now with BSYS, accounting structure, accounting processes are less evident. You must be careful on that. But we manage to do it, we go and look for book-entries, we can find it. Notably, those who were accustomed with Xsys and who were accustomed to perform processes rapidly, still make mistakes frequently.

One of the most valorizing aspects of unit managers' work was having relationships with top representatives of third parties such as hospital directors, mayors, or other elected politicians. Not all third parties provided accurate information, and units had sometimes to deal with errors and inaccuracies. In this context, unit managers encouraged third parties to provide the most accurate data possible, so as to be able to make payments the fastest possible way. This was done essentially through meetings or by phone. Practically, there remained errors in data provided by third parties, which had to be corrected in units. In turn, unit managers provided third parties with information about payment that helped them know whether their mandates were processed.

> Before, regularly, we were used to send them their cash flow situation with an Excel spreadsheet, while now they get it directly in the system. Since they do not have a policy of zero cash flow etc. but this allow them seeing at what point they are and to see also if their mandates are processed rapidly.

In addition, although managers had formal advisory roles, this was not done by all managers who did not really integrate this in their daily activity. Routine tasks, rather, mainly dealt with ensuring payments were made on time with accurate information and good levels of control. A manager explained he was pessimistic about his capability to be credible to third parties in delivering expert advice:

> Now I see that neither mayors nor CIOs ever call me. When there are problems, it goes through the departments. Thus, at the highest levels, it is dealt with the accounting manager of the city with my adjunct director who has the "cadre A" grade, barely with me. What makes me say that, contrary to the discourse of my director, and that of the minister […], third parties ignore the accountant [the unit manager], they do not need him. If they need some advice, they prefer to go in a private company and to pay […]. Well, why this? Probably one would need to look at in the past, I think we did not always

> responded to their expectations in this domain. Now, we are ready to do it, but I think it is too late. It is my feeling; I think it is too late. It is simply my personal feeling. I am open to make efforts to improve that, and I will do it, naturally because I cannot admit giving up such an important work, but I think we lost a lot.

Unit managers' roles and work thus let a large place to monitoring and control, while advisory roles were less salient. They had also the responsibility to ensure information provided by third parties were accurate and complete in order to make payments on time. Thought, managers felt the systems they had at hand were not satisfactory enough so as to allow them performing their tasks efficiently. Further, it did not provide sufficient capabilities for advisory roles. Thus, the implementation of BSYS created many expectations from managers, which we review in the projective agency section that follows.

5.9.3.2. Projective Agency

Projective agency reflects managers' positive expectations and fears for the future about BSYS. Unit managers felt that BSYS had potential to help them comply with the new accounting quality orientations. Work had no transparency, and unit managers had limited capability to exercise control over tasks within units. Further, for unit managers, legacy systems were made of too many applications. This involved entering data several times in systems, which was, sometimes, considered overburdening. As previously said these systems were flexible in-use and let a great deal of margin of liberty to managers. This flexibility raised serious threats on units that unit managers were more and more concerned of. A manager explained:

> We had such tolerant software that we could nearly make whatever we wanted with it. And since things were not standardized, people rushed into these possibilities, the third parties also.

They were expecting more compliance with norms and regulations from agents and third parties, which would ultimately lead to better accountancy quality.

> We considered that it needed to be automated in a modern system. It needed to be automated in order to minimize the risks of paying the wrong company.

Consequently, they placed strong expectations in BSYS and were convinced that this system would help them improve their capabilities and make evolve their managerial responsibilities.

> I am no longer simply a controller. I am also here to provide training, and I am accountable to you and to my minister on accounting, the quality of accounting. So I have to improve my work and my indicators of quality, which are read by my minister, which are read by you, or at least, that I have to deliver you.

A manager explained he expected BSYS to provide tools for better acknowledging the strengths and weaknesses in units:

> We will acknowledge the productivity gains and the management, I mean my adjunct and I, we will manage to focus […] on piloting tasks. And we have piloting tools that I now discover, that are very convenient, I would even say successful, but in any case very positive because it allows us seeing very rapidly the key points and the weak points of our work.

The underlying rationale of legacy systems was simple to understand, although ergonomics were poor. However, the multiple systems made work redundant with notable risks of errors. BSYS was thus expected to be a more "modern" system that would allow reaching ambitious objectives, part of the overall modernization of the public sector. The analysis of the projective element thus reveals that unit managers were all enthusiastic to play a role in these changes.

> It helps to go towards more modernization. These are the modern means of payment on the dematerialization of payroll. I think it helps you establishing closer ties with third parties and provides services closer to their expectations.

Importantly, BSYS offered answers to the main concerns of managers and third parties, which were of ensuring appropriate delays of payments. Managers expected that BSYS would help them in providing new and more efficient services to third parties and elected-politicians. BSYS was thus expected to help building closer ties with external stakeholders and to contribute to an increased legitimacy of managers who wished to be seen as capable to

provide high quality of service. Thus, unit managers saw in BSYS a means to better serve their third parties, or clients.

> We can prevail of our role to the third party only if we are competent to do it. In any case, we needed to put a mark on our territory; we needed to show our competencies. Now, I think that we get better and better recognized.

The analysis of the projective elements suggests that unit managers had a strong willing to make their work evolve and to perform tasks with greater added value and quality. They expected their advisory roles with the new system would increase. They also expected internal control and accounting quality principles in BSYS would help them better contribute to an efficient management of local public finance.

Some managers had fears about the implementation of BSYS. For example, a manager explained he feared to lose his marks with BSYS, to be misjudged and overly controlled:

> Thus we are somewhat in a change situation, we should recognize, in that the accountant (the unit manager) is no longer autonomous, is no longer the chief. They say "Sir, you did this, you did that! You did it like this, you did it like that!" "Why did you do it like this?" and then the bell of alarm, in a first time, and in a second time, the slaps come.

The practical evaluative element we review in the following section shows how unit managers responded to dilemmas and unexpected system outcomes.

5.9.3.3. Practical Evaluative Agency

Practical evaluation deals with unit managers' responses to emerging problems and dilemmas. Like many new disruptive systems, BSYS was found difficult to appropriate. Also, while the system was still under development, it had some errors managers had to cope with. Though, following the implementation of the IS, unit-managers had to explain the way changes would impact work in their unit and to accompany their staff in setting new work procedures. With a single way of performing operations, agents felt questioned in their work practices, and managers had to explain internal control and accountancy quality principles to them. In order

to benefit from the advantages of BSYS, managers thus strived to facilitate the transition from legacy systems to BSYS. This could for example be done through meetings and exploration of the system with agents for greater proximity. They could also find key users and relays within units who would help fostering the acceptance of the system. These actions reflected a more or less important commitment of managers in the success of the implementation of BSYS.

> I settled myself with the agents using BSYS in the unit. I took mandates in charge, and I shouted when it did not work anymore. I did like them, and in fact, for me, especially for receipts in the beginning, to prevent them from fearing BSYS, I made some mistakes myself. I did this in order to make it easier for them, for them not to be afraid.

With respect to third parties, unit managers explained the advantages of BSYS and used the capabilities of the system in order to constrain them to better comply with norms and procedures. They met them and made formal and informal presentations of BSYS. They thus felt there was a need to *discipline* and constrain them to feed accurate information into BSYS. This message had all the more impact on third parties as the greater quality of their input, the greater the quality of work delivered by local units. Furthermore, they were expecting being enabled by BSYS since they could browse payment status online in real time whenever they wanted. A manager explained:

> We made use of Bsys to make them integrate the norms. The leitmotiv was the following: Bsys is the rule! Bsys applies the rule! Thus, we told them: “if you want to be able to use Bsys, apply the rule!” and the rule it is Bsys.

Importantly, however, unit managers experienced important decrease in their freedom and margin of interpretation of operations within units. Since the implementation and use of BSYS within units were mandatory, and given constraints earlier discussed, managers had at first glance limited margin of liberty.

> Let’s say, we have no visibility over what we do. A procedure is assigned to every single task we perform. If we do not comply with it, it is blocking.

Notwhistanding these constraints, unit managers recognized the system helped them substantially which, when put in balance, made the system of the greatest interest within units.

> What was discovered only at the end is now discovered immediately. Thus, we are faster and more efficient. Further, the headquarters can access the system. This allows putting in place a modern control in local agencies, which have access to all functionalities like us. This allows them to see exactly what we do.

Importantly, they felt they were enabled in one of the key aspect of their work, which was ensuring efficacy in the payment process.

> I am most satisfied on the rapidity to make payments. Previously, we needed three days to make the payments. Under (the previous system), we took up to three days to completely process an order instead of doing it the same day.

Thus, constraints were not necessarily seen in bad eyes as long as they were perceived to enable them in turn. For that, clearly, BSYS constraints were accepted for the help it provided in units. It indeed resulted in more rigorous management and procedures, with expectations of increased quality and internal control.

> It is a big change, but I do not worry it because…it is a coming back to orthodoxy for both judicial and accounting procedures, and that's true that for months or even years, in fact, everybody took what I call "personal arrangement with the lord". This means that there was the theory and then, each unit had its own practices, third parties had their own practices, and we obtained things that where somewhat…lets say….very far from what was the rule.

Because BSYS provided increased control capabilities, more interesting tasks requiring more analysis, and interactions with third parties with more value, managers were ready to lose margin of liberty to benefit in turn with these new system outcomes. This is why, as explained in the analysis of the role of IT, several managers explained that the increased transparency within units for the headquarters would foster a better acknowledgement from them of problems encountered on the field.

Simultaneously, unit managers were willing to soften the constraints of some features. Doing so, they wished to increase their margin of liberty in their use of BSYS. This was motivated by the fact that, with the training they received and knowledge they had about BSYS, unit managers found a strict compliance with BSYS procedures rendered work more difficult.

> Previously, we were doing accounting regularizations, if you will, from an account to another, we managed to do it while now there is nothing to do, or we need a payment […] We should be able to find a way to avoid this kind of problems and having to ask such insignificant things to people…..

While they could not and where not willing to merely avoid complying with constraints (compliance was perceived to be a way of avoiding the problems found with previous systems), they however attempted to decrease it in order not to lose all their margin of liberty.

Some of the unit managers where disappointed with some aspects of BSYS. Those felt it did not exactly meet their expectations.

> When they showed it to us the first time, it was nice. One just had to push on a button, and everything went automatically. It was very nice. But it is not the reality. It will become the reality but it is not yet exactly the reality…

In response to the dilemmas posed by BSYS, and although BSYS was very restrictive, unit managers strived to exploit some margin of liberty with respect to the system. For example, they adapted the implementation of authentication profiles to the contingencies of their unit. In that, they felt it difficult to comply with BSYS because some agents were not replaceable within their unit. Thus, internal control procedure with unique authentication profiles could not be completely implemented. For that, most unit managers reported having set user profiles as *large* in order to make users as polyvalent as possible.

> You know, one must always widen user profiles. If, in a unit like this one, we make the system restrictive, we do not manage to work.

Although managers were conscious that this practice could formally be considered a threat to internal control procedures embedded in BSYS, it allowed them to get work done in their unit or to maximize the advantages of BSYS for them by increasing their margin of liberty.

> For the profiles, since we are a small LAU, everybody has the same profile. Thus, maybe this will change in the future, since in the beginning, when we migrated to Bsys, all authentication profiles were not available. That's true that we did not really make any effort to understand it at this time. For convenience reasons, we gave everybody the same accountant profile

Unit managers sometimes reported lacking some support after the implementation of BSYS, which was even more difficult for them as the system was still evolving. A unit manager explained that the control features integrated in BSYS prevented them to get work being done efficiently. For that, making user polyvalent could be seen as a compromise that allowed an acceptable – thus non optimal – implementation of BSYS.

> Unit manager: I understand well that need for security, but, in the beginning, the purpose of an accounting system is to make accountancy. It is not to create bottlenecks. Though, this does create bottlenecks. Which makes that we absolutely needed to refer to the theory, which said that we do needed to give our collaborators authorizations for certain tasks depending on their profile, because this was inevitable. This was not possible! Thus, my whole collaborators have a neutral profile.
>
> The researcher: thus, they can do everything?
>
> Unit manager: Everything! In order to ensure this fluidity.

While BSYS was not totally satisfactory in use, unit managers were confronted to important dilemma. They had to maintain their work standards with a system they actually hardly knew how to use its features efficiently, and which had unexpected flaws. Unit managers' enactments were focused at fostering an appropriate work environment so as to exploit the benefits offered by BSYS and at decreasing the restrictions embedded in BSYS, when doable. With the pressure of daily work requirements, it was especially important to ensure an appropriate work environment since the system was yet very disruptive within units. Clearly, authentication profiles were the main factor on which unit managers could act in order to

make the integration of BSYS in work practices easier. Thus, they exploited this margin of liberty, which helped decreasing constraints embedded in the IT.

5.10. Discussion

We attempted to identify the role played by IT on middle-managers' responses to the implementation of a disruptive IT in local units of a public administration. Some theories based on the theory of structuration of Giddens (e.g., DeSanctis 1994; e.g., Orlikowski 1992) suggest IT embeds structural constraints. According to some researchers, these theories go on to consider that " 'technology = structure', vs 'organizational actors = agency' '' (Thompson 2004, p. 13). Differently, with the practice lens, Orlikowski (2000) suggest that structure emanates from "recurrent social practice" (p. 407). Thought, most theories based on structuration research, however, consider human agency as unproblematic, which makes it a black box.

Following strategic actor theory (Crozier et al. 1977), our analysis suggests the relationships between agency and structure are grounded into middle-managers concrete system of action, but also in their motivations and strategic, rational behavior. Specifically, the IT became constraining to middle-managers in that integrating its features and functionalities into their work practices and units' procedures was the only way to manage to respond to the challenges they faced and to be enabled in other respects. In this perspective, it is by accepting constraints to a reasonable extent that middle-managers could continue to play "winning" games in their organization (Crozier et al. 1977). Indeed, promoting BSYS on the field helped "staying in the race" given the organizational and political pressures for improving the management of local public finance. Furthermore, constraints were perceived differently depending on the context of action of unit managers. They felt BSYS had different

implications within units depending on factors such as previous established practices, but also legacy relationships with third parties, and the quality of accountancy prevailing in units.

Meanwhile, unit managers still attempted to work around the system, thereby trying to maintain some margin of liberty. It can thus be considered that middle-managers played games with some rationality (Crozier et al. 1977) in the course of the integration of BSYS into their work practices. These games where such as, as argued by Crozier and Friedberg (1977), they readily accepted to lose in some areas (e.g., to be more controlled, to lose autonomy) if this would allow them to win in other areas (e.g., greater capacity to impose norms and normative principles to third parties, easier control of agents, tasks with more added value). They also tried to increase their mastery of uncertainty in some areas. In this perspective, according to Crozier and Friedberg (1977), the game is what conciliates freedom and constraints. For them, "the player remains free, but, if he wants to win, must adopt a rational strategy depending on the nature of the game and comply with its rules" (p. 113). This explains why managers accepted change in their unit. These results are important because they show that social actors are not completely determined by the IT in their actions.

What roles do middle-managers temporal orientations play in the formulation of their responses to IT change? The temporal perspective of human agency of Emirbayer and Mische (1998) helps further explain how temporal orientations influence action in the course of unit managers' integration of BSYS into their work practices. Unit managers formed positive expectations about BSYS before its implementation, but had apparently contradictory responses after its implementation in their unit. Indeed, while they adhered to the change as exemplified by their projections, their practical evaluations resulted sometimes in actions inducing workarounds. These workarounds could be considered as a compromise between making BSYS work in acceptable ways, while unit managers also found in it a way for

maintaining some autonomy and margin of liberty. It was acceptable because local units could not be easily provided with additional support. Though, BSYS was not already complete, and its features and functionalities were still, for some of them, under development. It helped maintaining some autonomy and margin of liberty because the best way to deal with difficulties was to decrease the importance of features that resulted in important constraints, such as the authentication feature and user profiles.

Managers resolved these contradictions in their temporal orientations with actions aimed at making BSYS work in practically acceptable ways in their daily operations. In that, middle-managers enactments could be considered to be what renders change possible on the field. For example, unit managers' unanimously praised internal control principles in their projective anticipations. Though, they were confronted to dilemmas in its implementation because it made them lose autonomy and induced important appropriation efforts, with what was perceived as lacks of support after the implementation of BSYS. Making agents polyvalent was a means to reconcile these contradictions, with minimal risks taken as compared to what was allowed with legacy systems. Confronted with the practical dilemmas of the present and with the challenges for the future, unit managers strived to make BSYS implementation a success in their unit in order to exploit its expected advantages as much as possible. This is evidence that unit managers are inserted into games, whereby they may readily accept IT constraints while in the same time they may attempt to increase their margin of liberty (Crozier et al. 1977).

Prior research suggests that middle manager knowledge of how operations are performed on the field is a somewhat irreplaceable asset for top managers (Currie et al. 2002; Floyd et al. 1997). This is because of their capacity to contribute to the mutual adaptation between the organization, people and the IT (Leonard-Barton et al. 1988). We confirm this by further

showing that middle-managers enactments resulting from their temporal orientations may or may not be perfectly in line with what is expected by the system. However, they are still those who can help dealing with the practical contingencies of distributed local units when they have the capability to make adjustments between the IT and their organization.

It is generally admitted that factors such as training, greater communication and support from top managers may help resolving inertia of practice and resistance to change (Leonard-Barton et al. 1988; Martinko et al. 1996). On the contrary, our results suggest, consistent with Crozier and Friedberg (1977) and with Beaudry and Pinsonneault (2005) to some extents, that what is probably most important for social actors is to find their own interest in change, and to have the capability to master the consequences and uncertainty that it conveys. This may probably help explain why many change initiatives, although rigorously conducted, result in failure. For that, it is often necessary for system designers to understand the games in which social actors are inserted when conducting IT implementation. This is what also makes middle-managers a key relay for the headquarters, because they also have the capability to understand the games played within their units, and hence to provide insights into how to conduct change successfully.

Our study contributes to research seeking to better understand the relationships between structures and agency. By analyzing the role of structures from the point of view of individual social actors, and by revisiting the relationship between agency and structure, our analysis helps furthering the issue of why IT implementation results in change. Structuration research has been criticized for not considering human agency as problematic, and thereby for offering insufficient conceptualization around this concept (Jones et al. 2008; Thompson 2004). By depicting social actors as exercising rationality in playing games, and by showing structural constraints emanate from social actors' insertion into these games (Crozier et al. 1977), we

offer, we believe an interesting approach that goes beyond some of the limitations of a view of the IT embedding structural constraints. Table 5.6 below summarizes elements of agency and IT structural constraints.

Table 5.6. Key Findings on Elements of Agency

Element of Human Agency	Description	Findings
IT structural Constraints	Role played in structural constraints in middle-managers enactments	• BSYS implementation was legitimate because it was seen as a means to respond to the challenges faced by public administration in general and local units in particular. • The IT becomes constraining because middle managers need to integrate its features and functionalities into their work practices to "continue to play".
Iterational Element	Middle-managers comfortable routines	• Unit managers had autonomy and freedom in responding to the dilemmas arising in their daily activity with flexible IT. • Middle-managers enjoyed having boundary spanning roles with interactions with third parties and the headquarters.
Projective Element	Middle-managers positive expectations and fears about BSYS	• Middle managers saw in BSYS a means to increase the overall quality of accountancy, transparency within units, security and rapidity of payments. • Middle-managers where enthusiast of playing part in the modernization of public administration.
Practical evaluative Element	Middle-managers responses to dilemmas arising when integrating BSYS into work practices	• Middle managers looked for ways to integrate BSYS into their work practices being disturbed the least possible in units. • Unit managers only partially integrated BSYS rules and procedures.

This study also contributes to research seeking to understand middle managers' responses to IT change in a public administration setting. Researchers argue that much remains to be known on middle-managers contribution to strategic changes (Floyd et al. 1997; Rouleau 2005; Schilit 1987), and we suggest they are those who allow IT change to be effective on the field in large distributed units of large organizations such as public administration.

5.11. Conclusion

The vast majority of studies of the work and roles of middle-managers in the context of IT change focuses on the large private corporation. We conducted a case study in geographically distributed units of a governmental public administration, investigating how and why middle-

managers respond to IT implementation. Since managerial decision making and structural characteristics in public organizations differ from that in private corporations (Fernandez et al. 2006; Rainey et al. 1995), it was important to address related issues.

Following the temporal theory of agency (Emirbayer et al. 1998), we highlighted how middle-managers responded to the implementation of a large disruptive IT. Similar to Chu and Robey (2008) we suggested their actions toward the technology emerged in response to contradictions across their temporal orientations that they sought to reconcile in their practical evaluations. In order to contribute to a better understanding of middle-managers' practical evaluation, we also used the lens provided by strategic actor theory (Crozier et al. 1977) along with temporal theory of human agency (Emirbayer et al. 1998). Through the lens of this theory, we suggested that actions taken by public middle-managers could be interpreted as resulting from games.

This study has several limitations. First, data were collected in a single point in time. It indeed makes use of retrospective accounts of middle-managers. We assumed that individuals remembered their actions and feelings over time, which was probably not always the case. Secondly, since we applied a single case design, we may not be able to reproduce the same findings in different settings. Though, this was not an objective, and we acknowledge that our results are grounded in our field.

Notwhistanding these limitations, we believe this study has important contributions for research and practice in IS in general and in the e-Gov field in particular. First, this study addresses important theoretical issues in IS structuration research (Jones et al. 2008) by offering deeper insights on how human agency is exercised within IT structural constraints. It suggests middle managers exercise rationality in playing games. This result is important especially because it helps understanding why social actors accept structural constraints

(Crozier et al. 1977). This also contributes to a better understanding of the micro dynamics of human action towards IT. Following an issue raised by Jones and Karsten (Jones et al. 2008) in their extensive review of structurational research, our perspective and results suggest that "agents comply with structural constraints because they choose, rather than are forced to do so" (p. 11).

Secondly, this research highlights human agency in public middle-managers, the enactments of whom remain understudied. The French public administration has been shown to increasingly integrate managerial principles in its *modernization* initiatives (Arkwright et al. 2007) mostly inspired from private organizations. Though, although public and private organizations still feature many differences (Caudle et al. 1991; Rainey et al. 1976), it is important to acknowledge how public middle managers – who receive and transmit change in organizations (Balogun et al. 2004) - respond to e-Gov initiatives. In this case, we suggest middle-managers are key actors who make change possible on the field.

The results of this study are important for top public managers for a better understanding of middle-managers contribution to the public sector's modernization. Importantly, it can help to identify areas where public middle-managers may be provided additional capabilities or where they require additional support and attention in order to foster e-Gov success.

Table 5.7. Appendix: Application of Klein and Myers' Principles for Interpretive Research

#	Principle	Description	Application in the study
1	Hermeneutic Circle	Meaning can be obtained through the understanding of parts of the whole, the whole, and its interactions.	• Identification of the meaning middle managers gave to their practices such as reflected in their discourse. • We strived to understand the relationships between these practices.
2	Contextualization	Requires that the researcher contextualize his study with respect to history and research setting.	• Interviews were conducted with both top managers in BETA and former managers of local units, which helped contextualize the research. • The phenomenon we study in local government is thus emerging from a singular context and is not intended to be generalized to other contexts.
3	Interaction between the researcher and subjects	The research material is a research construction emanating from the interactions between the researcher and the participants of the study	• As we interacted with participants, we acknowledged we probably influenced the way they reflected their historical accounts. • Similarly, our interaction with participants influenced our preconceptions and the way we interpreted their discourse. • Progressively, our understanding of the meaning of the actions taken by middle managers improved through these interactions.
4	Abstraction and Generalization	Consists in relating the findings from research material to general concepts and theories.	• We did not look for statistical representativeness, but rather for saturation of concepts.
5	Dialogical Reasoning	Highlights the contradictions that might arise between theoretical preconceptions and accounts that emerge from data.	• The research material was confronted with several theoretical lenses and only those which had the best fit were maintained for interpretations.
6	Multiple Interpretations	The researcher must be aware that participants can give different meanings to the same sequence of events.	• We remained conscious of these multiple interpretations during analysis. • These multiple interpretations could sometimes be considered as reflecting differences in participants' interests, uncertainty faced, and orientations for action.
7	Suspicion	Questioning the participants' view that might, for example, be distorted.	• We considered the viewpoint of multiple groups of actor and of former local unit managers. • By confronting unit managers' insights with that of other informants such as agents (informal interviews) or BSYS tutors, we could locate some areas where the discourse could be distorted.

Chapter 6

General Conclusion

6.1. Summary of Research Findings

In this dissertation we suggested approaches of user adaptation to IT following three theoretical lenses: the IS success model (DeLone et al. 2003), the Coping Model of User Adaptation (Beaudry et al. 2005), and a combination of Strategic Actor Theory (Crozier et al. 1977) along with temporal theory of human agency (Emirbayer et al. 1998) and the structurational model of technology (Orlikowski 1992). A final overview of the dissertation papers is provided in Table 6.1.

In the first approach, we examined how individuals who were disrupted by increasing amounts of system provided information responded to information overload. This research was needed in order to gain further insights on the issue of information overload which has been under investigated in MIS (Eppler et al. 2004). Further, prior research dealt with the influence of information quality on IS success (DeLone et al. 1992; DeLone et al. 2003), but little was said specifically on information Quantity.

The results show that information quantity positively impacts perceived information quality and user satisfaction but offer no support for the posited curvilinear relationship. This suggests that, consistent with O'Reilly (1980) individuals are likely to be more satisfied with more information at hand, although there are significant risks that information overload occurs and dampens their decision making effectiveness (Keller et al. 1989; Lee et al. 2004). We also found sorting and filtering capabilities to significantly impact user perceptions of the

quality of information. However, contrary to our expectations, it had no moderation effects on the relation between information quantity and perceived information quality. If system users perceive more quality in increasing amounts of information, it is also probably because they feel they have the capability to process incoming information. In fact, prior research found individuals develop spontaneously filtering heuristics that help prevent the negative consequences of information overload (Schultze et al. 1998). It also shows that indicators of IS success such as information quality or user satisfaction should cautiously interpreted.

In the second study, we developed measures for testing the Coping Model of User Adaptation elaborated by Beaudry and Pinsonneault (Beaudry et al. 2005). In addition, we analyzed the influence of espoused cultural values (Srite et al. 2006) on user coping strategies. The purpose of this research was to help open the "black box" of system usage and to understand how national cultural values impacted user adaptation to IT. This study demonstrates that CMUA is a valid model for the assessment of user strategies of adaptation to IT disruptions. It also shows that espoused national cultural values significantly influence how individuals adapt to systems. We suggest that studying these strategies of adaptation as moderator or mediator of variables in traditional adoption and acceptance research is likely to help opening the black box of system usage. This study is thus, we believe an important contribution to IS research (Benbasat et al. 2007).

In the third study, we used sociological approaches (Crozier et al. 1977; Emirbayer et al. 1998) in order to investigate human agency in middle managers enactments during IT implementation in public administration.

After analyzing what made the IT constraining for middle-managers, we described human agency around the IT following the conceptualization of Emirbayer and Mische (1998). Though, we examined their orientations toward the past, the present and the future.

Confirming prior research showing the relevance of this approach (Boudreau et al. 2005; Chu et al. 2008; Cousins et al. 2005), the study suggests that the temporal theory of human agency helps understanding middle-managers responses to IT change disruptions. It also complements prior studies by furthering the analyses of practical evaluations and of social actors' acceptance of structural constraints with the game perspective offered by strategic actor theory (Crozier et al. 1977).

We showed that the IT was constraining for middle-managers because this acceptance of IT constraining characteristics was a necessary condition to be enabled in other respects with the IT and to have margin of liberty in some areas. What is the role played by agency exercised by these managers? We showed middle managers resolved contradictions arising in their temporal orientations during their practical evaluations; they play games in these practical evaluative responses to dilemmas that arise during IT implementation. In resolving these contradictions, middle-managers make change designed by top managers possible on the field, by fostering IT functioning in practically acceptable ways.

This dissertation has a number of contributions for theory (6.2.1) and practice (6.2.2). We review these contributions next.

6.2. Contributions

6.2.1. Contributions to Theory

A first contribution of the dissertation papers has been to offer insights into the determinants of IS success in relation to user adaptation to IT disruptions. Chapter 3 shows that information quantity leads to greater satisfaction and perceived information quality, while prior research also link it with lower decision effectiveness performances (Lee et al. 2004; Lurie 2004).

Thus, studying IS success should include information quantity concerns and should consider its contradictory effects on user satisfaction and perceived quality and on user decision making performance.

Chapter 4 confirms that CMUA is a valid model and that user reactions to IT implementations are dependent upon their evaluations of threats and opportunities conveyed by an IT as well as their evaluations of their control over self, work, and technology. In response to the call of Benbasat and Barki (2007), Chapter 4 offers a view of user interactions with IT based on CMUA. It complements models in the traditional acceptance and adoption literature and suggests that IS researchers should further analyze moderating roles of user coping strategies on system adoption. Beaudry and Pinsonneault (2005) provided little guidance about how to test their model quantitatively and to examine its external validity and to use it in future research. We suggest including these strategies of adaptation can help diminish the distance between adoption outcomes and their more frequently cited determinants, such as ease of use, usefulness (Davis et al. 1989) or quality variables (DeLone et al. 2003) for example.

Furthermore, we significantly augment CMUA with the posited roles of individual differences, namely espoused individualism-collectivism and espoused uncertainty-avoidance. This helps furthering the measurement of national culture and gain greater knowledge about how it influences individual's interactions with IT. Our study confirms and furthers prior research using individual levels assessment and measurement of national culture (Dorfman et al. 1988; Hwang 2005; McCoy et al. 2005; Srite et al. 2006) with the concept of "espoused cultural values" (Srite et al. 2006). While not going beyond all of the criticisms made to the traditional ways of measuring culture, this conceptualization avoids a number of limitations found in Hofstede's (1980; 2001) indexes, such as ecological fallacy (Morgeson et al. 1999; Robinson 1950).

Conceptualizing national culture as espoused cultural values, we found interesting patterns of relationships between cultural values and user coping strategies. Specifically, we suggest that highly uncertainty avoidant individuals tended to implement more coping effort than low uncertainty avoidant individuals when confronted to IT disruptions. In contrast, we found the relation between control and an active coping strategy was lower for highly collectivistic individuals than for highly individualistic persons when the situation has opportunities. While researchers examined the influence of national culture on user adoption of IT (Hwang 2005; Karahanna et al. 2005; Srite et al. 2006), we contribute to IS research in studying its impacts on user adaptation to IT.

Finally, Chapter 5 offers an examination of why and how social actors accept structural constraints, a question that originated important debates in structurational research (Chu et al. 2008; Jones et al. 2008). IS structuration often focused on the relationships between organizations and the IT. Doing so, researchers often neglected to offer a conceptualization of human agency, which made we know very little on human agency during IT implementation. Furthermore, obviously, IT research has paid too little attention on why social actors use IT (Chu et al. 2008; Leonardi et al. 2008). In a recent study, Leonardi and Barley (2008) argue:

> "Even the most influential studies on organizations and information systems focus primarily on social dynamics or on how people interact with each other around the technology, rather than providing evidence of what specific material features people use, why they use them, and how and why their patterns of use shift over time" (p. 163).

Following Chu and Robey (2008), our study uses Emirbayer and Mische's (1998) theory of human agency and explains middle managers IT enactments and responses to constraints. Specifically, it helps answering to the issues raised by Crozier and Friedberg (1977), namely

the issues of understanding "why, how and to what extent the characteristics of the technology becomes constraining for social actors" and "to what extent, they can play with these constraints" (p. 141). Our research suggests that, like other categories of employees, middle-managers play games with some rationality in organizations. We found the IT was constraining because of managers willing to insert into "winning scenarios" for action. In other words, the constraining characteristics of the IT were accepted by managers because it allowed them benefit from margin of liberties in other areas.

The contribution of this paper is also on *middle-managers contribution to IT enabled transformation in e-government*. Fostering successful and cost-effective change in public administration is a grand challenge in many countries and in France in particular. While a vast majority of IS studies focused on private corporations, we examined our research questions in a pubic administration setting. We show that, by resolving contradictions arising from their temporal orientations, these managers make change designed by top managers possible on the field. This study thus helps gaining knowledge into how to foster IS success, which is crucially important given the often reported high rates of failure of IT projects.

6.2.2. Contributions to Practice

This dissertation makes also contributions to practice. Chapter 3 emphasizes the complex influences of the volume of information provided by systems. While it is positively related with information satisfaction and perceived information quality, information overload is sometimes said to be negatively related with decision accuracy. For that, system designers should pay sufficient attention to the information quantity issue when designing systems.

Chapter 4 suggests that individuals differ in their adaptive behaviors depending on cultural values. This emphasizes the need for appropriate actions and training agenda in order to foster attitudes conveying successful adaptive behaviors. System designers and change

implementers may probably foster IT users control capabilities and influence their work environment. In that, individual differences such as user cultural values should also be taken into account. In increasingly diverse cultural work environments, understanding how individuals who espouse different cultural values adapt to systems may probably help make useful uses of individual differences in order to foster acceptance, best practices and system success all along the lifecycle of an IS.

Finally, Chapter 5, by focusing on the responses and contribution of middle-managers to IT change in public administration, helps public management in identifying ways to envisage how these managers can foster system success at operational levels. Our results suggest that these managers are in the best place to find practical responses to dilemma on the field. Especially, our study gives to understand that IT constraints in disruptive IT change are not rejected a priori. Instead, they are readily accepted when social actors find possibilities to benefit from other enabling capabilities.

Table 6.1. Concluding Summary Table

Aspect of the Studies	Chapter 2: Information Quantity and IS Success	Chapter 3: User Strategies of Adaptation in the Presence of Disruptive Technologies	Chapter 4: Managerial Adaptation Strategies to IT Change in Public Administration
Research Questions (reminder)	▪ What are the effects of information quality on system usage and user satisfaction? ▪ Do increasing amounts of system-provided information and information uncertainty have detrimental effects on information quality? ▪ Can the impacts of increasing amounts of information be mitigated by filtering mechanisms?	▪ Is there empirical support for CMUA using a variance approach? ▪ What influence do espoused uncertainty avoidance and espoused individualism-collectivism have on how system users adapt to systems?	▪ What role do structural constraints play in the development of managers' enactments and responses to changing IT environments in public administration? ▪ What roles do middle-managers temporal orientations play in the formulation of their responses to IT change?
Key Findings	▪ Information quantity is related with greater perceived information quality. ▪ Information uncertainty is related with lower perceived information quality. ▪ Filtering and sorting mechanisms are related with greater perceived information quality.	▪ CMUA is a valid model for understanding user strategies of Adaptation to disruptive IS. ▪ Individuals who espouse high uncertainty avoidance cultural values adopt more problem-focused, active adaptive strategies such as Benefits Maximizing or Disturbance Handling. ▪ Individuals who espouse high collectivistic cultural values adopt more emotion-focused adaptive strategies such as Benefits Satisficing or Self-Preservation.	▪ Temporal human agency and strategic actor theories are relevant for understanding middle-managers enactments during and after IT implementations. ▪ Middle-managers responses to IT constraints emanates from the game in which they are inserted. ▪ Middle managers enactments are what render change possible on the field.
Contributions	▪ Helps better understanding the impacts of information quantity and on IS Success; suggests information quantity should be taken into account in IS success research. ▪ Analyses of user interactions with a system in information overload conditions. ▪ Links choice uncertainty to perceived information quality.	▪ Helps opening the black box of system usage. ▪ Shows the influence of national cultural values in the context of adaptation to disruptive IT implementation. ▪ Develops measures to test CMUA quantitatively.	▪ Helps understanding why social actors use IT and accept constraining characteristics. ▪ Study of middle-managers agency in a public administration setting.
Limitations	▪ The generalizability of the findings is limited to website IS. ▪ Only the "information quantity" aspect of information overload has been considered.	▪ Use of student subjects and scenario approach that may diminish critical realism. ▪ Assumption that subjects represent accurately the situation with a scenario approach. ▪ Study of a limited number of adaptive strategies.	▪ The findings are grounded in a specific context. ▪ A more in-depth analysis of middle-managers system of action would allow gain further insights in the games they play.

Future research	▪ Examination of information overload as occurring with office information systems (e.g., emails, ERP systems, Decision Support Systems).	▪ Integration of user coping strategies in models of acceptance and adoption of IT as mediator or moderator. ▪ Analysis of user coping strategies in voluntaristic context and compare it to a mandatory use context. ▪ Replication of the research in a real world setting. ▪ Identification of other coping strategies of adaptation.	▪ Further examination of the games played and identification of what is the system of action.

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