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Towards a Better Comprehension of Adaptation to Information and Communication Technologies: A Multi-level Approach

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BY

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ACCEPTANCE

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ABSTRACT

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Najma Saidani

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Despite the variety of literature on 'adaptation to technology', the literature still witnesses a gap concerning the concept of adaptation especially about its multi-level nature. Recognizing the multilevel nature of IS adaptation, we rise the challenge of conducting an alternate template analysis of three cases of adaptation to IS in order to provide complementary explanations about the phenomenon.

In order to expand the comprehension of the 'adaptation' concept, a multi-study dissertation model is adopted. The objective is to examine the adaptation concept on three different levels: the individual, the group level, and the organizational level. This thesis aims at 1) exploring the shaping of individual adaptive actions that knowledge workers engage towards technostress with a focus on the factors that influence their adaptation process; 2) examining the adaptive performance of a group facing an newly-implemented technology based on the adaptive structuration theory (DeSanctis and Poole 1994) under which were puzzled the concepts of affordances (Leonardi 2011, Leonardi, Huysman et al. 2013) and the structure of usage (Burton-Jones and Straub Jr 2006, Burton-Jones and Gallivan 2007); 3) examining, through an organizational learning lens (Argyris and Schon 1978), the case of an organizational adaptation to environmental technological changes examined within a managerial cognition conceptual framework (Orlikowski and Gash 1994); (Bijker 1987, Bijker 1995). To answer the different research questions, the three studies adopt a qualitative approach falling within a critical realist perspective.

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ATTENTION : The English version of the dissertation begins on page 16

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Table of Contents

Chapter 1 : Introduction Générale

1.1. Résumé

Malgré la variété des travaux sur l'adaptation aux technologies de l'information et de la communication (TIC) dans la recherche en Systèmes d'Information (SI), la littérature continue à présenter un intérêt à l'étude du concept d'adaptation et plus spécifiquement à sa nature multi-niveau.

Afin de contribuer à une meilleure compréhension des problématiques relatives à ce phénomène, cette thèse, à travers l'analyse de trois cas d'adaptation aux SI, traite le sujet de l'adaptation en mobilisant trois cadres théoriques distincts afin d'offrir des explications complémentaires au phénomène. En effet, nous étudions le phénomène de l'adaptation sur trois niveaux : le niveau individuel, le niveau du groupe et le niveau organisationnel.

Cette thèse, examine 1) l'émergence des réponses adaptives des 'travailleurs intellectuels' (knowledge workers) aux technostress et les facteurs qui influencent ce processus 2) la performance adaptive d'un groupe (Adaptive Team Performance) face à une technologie nouvellement implémentée qui affecte ses routines de travail et 3) le processus d'adaptation d'une organisation aux changements technologiques qui touchent son l'environnement, en l'occurrence, la percée de l'utilisation des outils collaboratifs, notamment des réseaux sociaux d'entreprise.

Pour répondre aux questions de recherches qui sont posées, ces études adoptent des méthodologies qualitative enracinée (Grounded Theory) (Chapitre 3) et qualitative réaliste critique (Chapitre 4 et 5).

Ce chapitre introductif est structuré de la façon suivante: dans un premier temps, nous motivons notre intérêt pour l'étude du phénomène de l'adaptation sur différents niveaux et indiquons comment nous entendons améliorer notre compréhension du phénomène. Ensuite, nous exposons nos positions ontologique et épistémologique adoptées dans la thèse. La troisième partie de ce chapitre présente synthétiquement chacune des trois études. Pour chaque étude, les « gaps » aussi bien théoriques que managériaux auxquels les études tentent

d'apporter une réponse, sont présentés, suivis des questions de recherche et d'une présentation de l'approche méthodologique adoptée.

1.2. Pourquoi étudier l'adaptation sur différents niveaux ?

La recherche en SI examine des phénomènes aussi riches que complexes qui se focalisent notamment sur les interactions entre humains et technologies (Aubert, Barki et al. 2008)

Nous considérons dans nos travaux que l'adaptation aux SI est un phénomène multi-niveau. L'examen de ce phénomène implique ainsi la prise en considération de différents niveaux d'analyse ainsi que les interactions et influences entre ces niveaux.

Les trois études que nous avons réalisées, chacune se focalisant sur un niveau, considèrent le processus d'adaptation comme l'effort fourni afin d'apporter les ajustements nécessaires à la situation actuelle, généralement de déséquilibre, pour produire une nouvelle situation qui serait conforme aux exigences et regagnerait l'équilibre initial.

Dans chaque étude, la dimension technologique est centrale dans le développement théorique ainsi que dans le travail empirique visant à évaluer l'émergence et l'évolution des processus d'adaptation. En effet, dans les trois études, la technologie constitue l'élément central déclencheur et catalyseur des trois processus d'adaptation sous étude.

Ainsi une caractéristique commune entre les trois études est l'attention portée à l'interaction entre différents acteurs de différents niveaux (les individus, le groupe comme collectif et l'organisation comme entité) et la technologie.

Dans la première étude, qui traite du niveau individuel de l'adaptation, la collecte et l'analyse des données ont été réalisées sur le niveau individuel. Dans les deuxième et troisième études, les données ont été collectées sur le niveau individuel mais agrégées au niveau du collectif lors des analyses.

En effet, les définitions que la littérature propose à l'adaptation individuelle, de groupe et organisationnelle témoignent de la nature multi-niveau du phénomène. Dans le tableau 1 qui suit, nous présentons ces définitions.

Niveau	Définition
Individuel	Les efforts cognitifs et comportementaux qu'une personne engage afin de gérer des demandes internes ou externes et qui sont perçues comme dépassant ses propres ressources d'adaptation (Lazarus and Folkman, 1984)
Groupe	Le changement dans la performance d'un groupe en réponse à d'importants signaux environnementaux impliquant un changement pour le groupe. L'adaptation du groupe se manifeste dans l'invention ou la modification des structures existantes, des capacités de ses membres et/ou de leurs objectifs (aussi bien cognitifs que comportementaux) (Burke et al., 2006)
Organisationnel	Les modifications et changements entrepris d'une organisation ou de certaines de ses composantes afin de s'ajuster à son environnement. (Cameron, 1984)

Tableau1 : Définitions de l'adaptation selon les niveaux d'analyse

1.3. Les paradigmes de l'approche multi-niveaux :

La recherche en Systèmes d'Information présente un intérêt à pour les approches multi-niveaux. Les deux idées fondamentales de ces approches sont 1) la centralité des échanges entre humains et technologies dans le domaine des SI et 2) les interactions entre les entités composant chaque niveau et leurs influences mutuelles. Ces interactions contribuent à l'émergence de construits de plus haut niveau (higher-level constructs) qui ne sont pas uniquement de nature humaine.

De ce fait, les chercheurs en comportement organisationnel ont développé des paradigmes qui ont tenté d'apporter des réponses aux questionnements fondamentaux constituant la base de l'approche multi-niveau. Certains se sont focalisés sur 1) Qu'est-ce-qu'un collectif ? Comment sont constitués les niveaux micro et macro (Morgeson and Hofmann 1999) ; (Kozlowski and Klein 2000). D'autres se sont intéressés aux questions 2) Quels liens à établir entre les différents niveaux ? Quelle modélisation des liens peut-on développer ? (Chan, 1998; Rousseau, 1985). Un autre courant s'est concentré sur la question 3) Comment tester et

analyser les différentes variables et entités au sein du même niveau et entre les différents niveaux ?

Nous traitons les différents points que les paradigmes de l'approche multi-niveau soulèvent tout en démontrant comment les différentes perspectives que nous présentons dans cette thèse y répondent.

En ce qui concerne le premier point (à savoir qu'est-ce qui constitue les niveaux micro et macro), nous présupposons l'existence de deux niveaux distincts : le niveau micro et le niveau macro. Dans notre cas, le niveau micro fait référence aux individus, à leurs perceptions et aux actions qu'ils entreprennent en relation avec les technologies. Le niveau macro considère un plus haut niveau où les entités du niveau micro sont agrégées. L'agrégation de ces entités peut se manifester aussi bien sous la forme de dyade, d'une équipe, d'un groupe ou d'une organisation. Elle se base sur une hypothèse centrale selon laquelle les entités du niveau micro qui forment le collectif sont nécessairement en interaction. Les interactions entre les entités et leurs influences mutuelles conditionnement l'agrégation des entités du niveau micro en un seul collectif. Ce collectif, étant un système ouvert, peut, lui-même être en interaction avec d'autres collectifs ce qui résulte en l'émergence de nouveaux collectifs d'ordre plus grand.

Dans notre première étude (Chapitre 3), nous explorons du processus que suivent les travailleurs intellectuels (knowledge workers) pour engager une réponse adaptative aux états de technostress qu'ils vivent. Nous considérons le travailleur intellectuel comme unité d'analyse et nous focalisons sur ses perceptions et actions. Nous nous positionnons donc au niveau micro parce que les entités qui constituent ce niveau ne sont pas en interaction ce qui empêche la formation d'un collectif.

Dans la deuxième étude (Chapitre 4), nous analysons le processus d'adaptation d'une équipe au sein d'une organisation à une nouvelle technologie qui affecte ses routines de travail. Nous considérons cette équipe comme un collectif dont les entités (les membres de l'équipe) interagissent afin d'accomplir une tâche commune. Les données ont été collectées au niveau micro et leur analyse entreprise au niveau du collectif.

Dans la troisième étude (Chapitre 5), nous étudions le cas d'une transformation organisationnelle engagée en réponse aux changements environnementaux en matière d'évolution technologique. Nous examinons les effets des changements des cadres technologiques (technological frames) au sens d'Orlikowski and Gash (1994), sur le système

d'apprentissage de l'organisation. L'organisation est donc une entité qui représente un collectif compte tenu des interactions qui existent entre ses composantes (individus, équipes, départements…).

Concernant le deuxième paradigme, à savoir quels liens sont à établir entre les entités au sein du même niveau et entre les différents niveaux, Rousseau (1985) a proposé une classification des modèles de recherche multi-niveau. Trois modèles existent; 1) les modèles de composition où des interactions ont lieu entre des variables appartenant à différents niveaux mais non-dépendantes les unes des autres et 2) les modèles croisés (Cross-level models) où il y existe des interactions aussi bien entre les entités du même niveau qu'entre les entités de différents niveaux. En d'autres termes, les modèles croisés supposent que :

- Des interactions existent entre les entités du même niveau (l'examen des interactions entre les entités dépendantes et indépendantes du même niveau aide à offrir des explications du phénomène en établissant des liens de causalité) ce qui implique,
- L'émergence d'une explication du même phénomène sur un plus haut niveau d'analyse se basant sur l'examen des interactions entre les entités appartenant à différents niveaux.

Le troisième modèle concerne les modèles multi-niveaux qui incluent les deux modèles précédents et qui suppose l'existence d'interactions entre les entités dépendantes et indépendantes de différents niveaux d'une part et la généralisation de ces relations d'autre part.

Chan (1998) a également proposé une typologie des modèles multi-niveau qui se base sur le niveau de collecte de données et sur le niveau d'analyse de ces données. Seule notre étude au niveau du groupe obéit à cette typologie, vu que les données ont été collectées au niveau individuel mais agrégées, lors de l'analyse, afin d'établir des conclusions au niveau collectif.

Dans une récente méta-analyse sur les recherches multi-niveaux dans la littérature en Systèmes d'Information, Bélanger, Cefaratti et al. (2014) ont présenté une typologie des modèles de composition initialement développés par Rousseau (1985). Ces auteurs ont établi une distinction entre les modèles « mono-composition » et les modèles « mixed-composition ». Les premiers, aussi libellés « modèles de composition originaux », concernent les modèles où les entités en interaction sont de même nature (généralement des individus composant un collectif d'individus). Selon les auteurs, ce type de modèle, bien que

constituant le type majoritairement utilisé dans les recherches en organisations, ne convient pas pour les recherches en Systèmes d'Information qui se veulent multi-niveaux. En effet, ce type de modèle ignore l'un des fondamentaux de la recherche en SI à savoir l'interaction entre humains et technologies, deux entités de natures différentes.

La recherche en SI examine différentes situations où les humains et les technologies interagissent. Par exemple, les recherches sur le développement des Technologies de l'Information (TI) et sur leur usage ; traitent des interactions entre humains et technologies. Les recherches sur les pratiques se basant sur les TI (comme la collaboration grâce aux réseaux sociaux d'entreprise, ou le management des connaissances grâce aux outils de partage), traitent des interactions entre humains via les technologies. Cette distinction soulève la problématique de la mobilisation de l'approche multi-niveau en SI et plus spécifiquement de la place de la technologie dans ces modèles. En effet, les technologies, comme entités à part entière, peuvent être examinées au travers de modèles de « mono-composition », par exemple par l'étude des différents modules (entités du niveau micro) dans un progiciel (entité d'un niveau plus haut) ou aussi à travers des modèles de « mixed-composition », par exemple par l'étude de la rapidité des décisions des humains utilisant différents modules d'un ERP).

Les trois études qui composent notre thèse, adoptent des modèles de composition mixtes. En effet dans la première étude (Chapitre3), nous proposons d'étudier les réponses adaptatives des travailleurs intellectuels au technostress générés essentiellement par l'utilisation massive des Technologies de l'Information et de la Communication (TIC). Cela implique la prise en compte l'interaction entre les travailleurs intellectuels comme individus et les technologies, deux entités de natures différentes.

Dans la deuxième étude (Chapitre 4), nous examinons le processus d'adaptation que l'équipe de travail (comme collectif) met en œuvre face un évènement technologique qui influence ses routines de travail. Une première réflexion à propos du type de ce modèle laisse penser à un modèle de mono-composition vu que nous cherchons à examiner les perceptions et les actions collectives à travers l'analyse des perceptions et actions individuelles et donc que nous utilisons des entités de même nature (des humains qui constituent un collectif d'humains). Une réflexion plus profonde opterait pour la typologie « modèle de composition mixte » parce que les individus formant le collectif dépendent en partie de la technologie dans leurs interactions.

Dans la troisième étude, nous examinons comment une organisation a implémenté un réseau social d'entreprise afin de lutter contre la surcharge informationnelle et visant à instaurer un nouveau schéma de dynamiques et interactions organisationnelles. La technologie, en l'occurrence un réseau social d'entreprise, est le moyen des interactions entre individus formant le collectif. Par conséquent, nous considérons cette étude comme relevant d'un modèle de composition mixte.

Aussi, Bélanger, Cefaratti et al. (2014) ont proposé une catégorisation des thématiques SI étudiées à travers l'approche multi-niveaux. Les trois perspectives du concept de l'Adaptation que nous proposons dans cette thèse rentrent dans les champs de la dite catégorisation. Nous les exposons dans le tableau 2 suivant.

Thématique SI	Description	Numéro de l'étude correspondante
Usage continu des SI	Se concentre sur l'examen des impacts des TI sur les perceptions des individus, leurs comportements et l'usage qu'ils en font.	Etude #1: Explorer l'émergence de l'adaptation des travailleurs intellectuels au technostress.
Usage initial des SI	Se concentre sur l'introduction des TIC auprès d'usagers finaux.	Etude#2: Analyser l'adaptation d'une équipe de travail à une technologie nouvellement implémentée.
Collaboration	Se concentre sur la technologie comme moyen d'interactions entre deux individus ou plus ayant des objectifs de travail communs.	Etude #3: Etudier le cas d'Alpha, une entreprise qui s'est lancée dans un programme de transformation digitale en remplaçant les emails par un réseau social d'entreprise.

Tableau 2 : les thématiques SI correspondantes aux trois études

1.4. Le positionnement ontologique et épistémologique de notre thèse

Afin d'examiner un phénomène selon de nouvelles perspectives, les chercheurs peuvent suivre l'une des approches suivantes : examiner le phénomène à partir d'une seule position

ontologique et épistémologique ou opter pour différentes positions. Dans notre thèse, nous avons opté pour la première alternative parce que la deuxième aurait nécessité le travail de plusieurs chercheurs sur une longue période de temps (Petter and Gallivan 2004).

Nous adoptons le réalisme critique comme position méta-théorique qui est réaliste dans son ontologie et relativiste dans son épistémologie (Archer et al. 1998; Bhaskar, 1979). Cette position présuppose une certaine perception du 'monde' et de la construction des connaissances humaines. En effet, les réalistes critiques sont considérés comme réalistes parce qu'ils croient en l'existence d'une réalité objective et la séparation entre cette réalité et la connaissance humaine s'y rapportant. Cette idée présente des différences avec les ontologies classiques comme le positivisme où la réalité est restreinte aux connaissances que les humains développent en testant et mesurant cette réalité ou comme le constructivisme pur où la réalité est une construction humaine se basant sur les interprétations qu'ils développent et leurs perceptions des phénomènes.

La dimension critique du réalisme critique provient du fait que la réalité est considérée comme objective, perceptible et compréhensible mais que les perceptions que les individus en développent sont fonction des cadres théoriques qu'ils adoptent. Les humains sont capables de développer des perceptions de la réalité et d'y apporter des explications pare qu'ils sont dotés de la faculté de raisonnement dans le sens Kantien.

Les réalistes critiques considèrent la réalité comme non seulement intransitive mais aussi stratifiée de deux manières. La première stratification concerne les liens entre trois domaines : les mécanismes, les évènements qu'ils génèrent et la partie perceptible de ces évènements. Les mécanismes et les évènements constituent le domaine du 'réel' ou l'ensemble de la réalité objective. Le domaine de 'l'actuel' est constitué des évènements qui existeraient (ou pas) dans la sphère réelle. Le domaine 'empirique' est constitué uniquement des évènements dont l'expérience est possible par les humains.

La deuxième stratification concerne la notion de l'«emergent power materialism » selon les termes de Bhaskar. En effet, dans le domaine du réel, il existe des interactions complexes entre différents systèmes ouverts, stratifiés et dynamiques, matériels ou non matériels qui suivent des structures particulières et résultent en des liens de causalités, des tendances et des chemins d'actions. Ces structures particulières sont nommées 'mécanismes générateurs' parce qu'elles génèrent le domaine de l'actuel.

Dans la recherche en Systèmes d'Information, l'intérêt porté pour le réalisme critique comme une approche métathéorique est croissant parce qu'elle permet aux chercheurs de fournir de plus riches explications des phénomènes complexes et de ne plus uniquement se concentrer sur les méthodes et les données.

Les trois études que nous présentons dans notre thèse adoptent une position réaliste critique en se focalisant sur l'émergence des processus d'adaptation et leurs évolutions.

Dans la première étude (Chapitre 5), nous explorons l'émergence des réponses adaptatives des travailleurs intellectuels confrontés au technostress afin de comprendre la nature de ce processus. La question centrale de l'étude consiste à déterminer le « comment » de l'émergence et l'évolution des actions adaptatives engagées par les travailleurs intellectuels.

Dans la deuxième étude (Chapitre 4), nous étudions le processus par lequel l'action adaptative d'une équipe de travail émerge lors de l'utilisation d'une nouvelle technologie. Nous avons procédé à cet examen en mobilisant le concept de 'performance adaptative du groupe', le concept de 'Affordances' et le concept de 'Structure d'usage' qui reflètent les mécanismes d'émergences des actions adaptatives lors des interactions entre humains et technologies

Dans la troisième étude, nous suivons comment une organisation, à travers la veille de l'environnement, détecte des signaux de changements et les interprète comme nécessitant une transformation organisationnelle. Nous nous sommes intéressés à comprendre comment cette décision de transformation digitale a émergé et comment sa mise en œuvre a affecté le système d'apprentissage organisationnel.

1.5. Présentation des études de la thèse :

	Etude #1	Etude #2	Etude #3
Unité d'Analyse	Individu	Groupe	Organisation
Questions de Recherche	QR 1: Comment les facteurs technologiques et environnementaux produisent-ils des misfits résultant en l'état de Technostress ? QR 2: Comment les travailleurs intellectuels répondent-ils au technostress?	RQ 1: Quelles affordances sont constituées au cours des interactions entre les membres de l'équipe et la nouvelle technologie. Quelle est la structure d'usage de la nouvelle technologie? RQ 2: Quelles adaptations ont lieu?	QR 1: Par quel processus les organisations engagent-elles des actions adaptatives face à des changements technologiques dans leur environnement ? QR2: Comment leur système d'apprentissage organisationnel est-il affecté?
Concept clés	Adaptation individuelle, Technostress, Coping, TIC	Performance adaptative du groupe, Mouvements d'appropriation, Affordances, Structure d'usage	Adaptation organisationnelle, Cadres technologiques, Apprentissage organisationnel, Attention au changement.
Approche Méthodologique	Grounded Theory (20 entretiens)	Recherche qualitative réaliste critique (10 entretiens)	Etude de cas réaliste critique (10 entretiens)
Echantillon	20 travailleurs intellectuels de différentes organisations et industries.	L'équipe d'une fondation universitaire, la « Fondation Dauphine » de l'Université Paris-Dauphine (10 entretiens semi-directifs).	Le cas d'Alpha, une organisation qui s'est lancée dans un programme de transformation digitale en remplaçant l'email par un réseau social d'entreprise.
Propositions Générales	Face au Technostress, les travailleurs intellectuels engagent un processus d'adaptation. L'action adaptative qui en résulte est fonction de différents facteurs (institutionnels, sociaux et individuels).	Afin de s'adapter à la nouvelle technologie affectant leurs routines de travail, les membres de l'équipe se basent sur leurs perceptions des structures organisationnelles, du climat de leur équipe et des caractéristiques de leurs tâches.	Confrontées à des changements technologiques, les organisations changent de cadre technologique et engagent un processus d'adaptation afin d'apporter les ajustements nécessaires. Par conséquent, elles modifient leur système d'apprentissage.

Tableau 3 : Présentation des études de la thèse.

1.5.1. L'exploration de l'émergence des réponses adaptatives des travailleurs intellectuels au technostress :

La première étude de notre thèse propose d'apporter des réponses à une question relativement peu développée dans la littérature en Systèmes d'Information à savoir : Comment les travailleurs intellectuels s'adaptent-ils au technostress ? Les deux objectifs de cette étude sont 1) établir l'état d'art de la littérature SI sur le phénomène de Technostress et 2) comprendre comment la réponse adaptative des travailleurs intellectuels se forme et quels facteurs l'influencent.

En effet, cette étude tente de répondre à différents appels dans la littérature concernant l'analyse des conséquences négatives des investissements des organisations dans les Technologies de l'Information et la Communication (TIC) (Tarafdar, Gupta et al. 2013). Il est admis que les TIC offrent de nombreux avantages aux organisations mais qu'elles ne les épargnent pas de phénomènes néfastes comme le Technostress, défini comme le stress que les salariés éprouvent quant à l'usage des systèmes d'information dans le contexte organisationnel (Tarafdar, DArcy et al. 2015). Les travailleurs intellectuels sont considérés comme les premiers « consommateurs » de ces technologies vu que l'information constitue la matière première de leur travail. Ils utilisent donc ces technologies quotidiennement afin d'accomplir leurs tâches ce qui les exposent en continu au technostress et les obligent à s'y adapter.

Un courant dans la recherche en SI s'est focalisé sur les effets néfastes de l'utilisation massive des TIC dans les contextes organisationnels. Les chercheurs ont été intéressés à des phénomènes proches du Technostress comme le burnout au travail (King and Sethi 1997), (Pawlowski, Kaganer et al. 2007) ou encore l'angoisse face aux ordinateurs connu sous le nom de 'Computer Anxiety' (Thatcher and Perrewe 2002), (Fuller, Vician et al. 2006), (Buche, Davis et al. 2007). Le phénomène de Technostress gagne ainsi en importance depuis deux décennies et le travail fondateur de Brod (1984). En plus des différentes définitions que les chercheurs ont proposées, différentes conceptualisations théoriques et approches empiriques ont vu le jour.

Malgré ces travaux, la littérature SI sur le technostress reste encore très fragmentée (D'Arcy, Gupta et al. 2014), (Tarafdar, DArcy et al. 2015). Les revues de référence en SI manquent d'études de nature à renforcer nos connaissances sur ce phénomène. Une récente revue des

articles sur les effets négatifs de l'usage des TIC au sein des organisations dans les principales revues en SI n'affiche ainsi que 37 articles entre 1995 et 2005 (Pirkkalainen and Salo, 2016).

Notre étude répond à ces questionnements aussi bien conceptuels que managériaux et tente d'offrir de nouvelles perspectives de recherche sur le technostress. Pour cela, nous explorons les situations d'inadaptation qui sont susceptibles d'engendrer le technostress et les classons en situations d'inadaptation technologique et/ou environnementale. Nous postulons que les états de technostress sont la manifestation de cas de dissonance que les travailleurs intellectuels vivent. Cette dissonance représente l'écart existant entre la attentes et la réalité : en l'occurrence, les avantages escomptés de l'investissement en TIC ne sont pas toujours atteints en réalité du point de vue des salariés notamment ; ces avantages « théoriques » se transforment parfois en inconvénients.

Un autre phénomène qui a été peu étudié dans la littérature SI est la façon dont les individus s'adaptent au technostress qu'ils vivent. En effet, la littérature SI s'est beaucoup intéressée à l'adaptation individuelle et différentes approches ont vu le jour au travers de différents concepts, comme par exemple : l'appropriation (Poole, Homes et al. 1988), (DeSanctis and Poole 1994), la réinvention (Rice and Rogers 1980), (Leonard-Barton 1988), les ajustements (Majchrzak and Cotton 1988), le coping (Beaudry and Pinsonneault 2005). Ces concepts ont permis de mieux comprendre plusieurs facettes de l'adaptation individuelle aux technologies. Beaudry and Pinsonneault (2005) proposent le 'Coping Model of User Adaptation, un cadre intégrateur qui tient compte des apports des travaux relevant de ces différentes traditions de recherche.

La littérature sur l'adaptation individuelle aux TIC, en particulier celle qui se fonde sur le concept de coping se base toutefois sur un postulat commun ; les individus, face à des évènements technologiques perturbateurs, mettent en œuvre des stratégies d'adaptation afin de retrouver leur situation d'équilibre initial. Nous considérons que cette approche de l'adaptation n'est pas pleinement compatible avec le technostress qui ne constitue pas des événements perturbateurs ponctuels mais des états continus dans le temps. Pour cela, une compréhension plus complète de l'adaptation est nécessaire pour pouvoir explorer comment les individus s'adaptent au technostress.

Nous tentons de répondre aux questions de recherche suivantes :

> *QR1 : Comment les inadaptations technologiques et environnementales déclenchent-elles le technostress chez les travailleurs intellectuels ?*

QR2 : Comment les travailleurs intellectuels s'adaptent-ils au technostress ?

Afin de répondre à ces questions, nous adoptons une approche qualitative enracinée (Grounded Theory) vu la nouveauté des questionnements et la littérature peu abondante les concernant. Nous avons conduit 20 entretiens semi-directifs avec des managers appartenant à différentes entreprises et différentes industries.

1.5.2. La performance adaptative du groupe : une perspective par les affordances et la structure d'usage :

Notre deuxième étude contribue à la littérature SI sur la performance adaptative du groupe. Nous étudions le processus d'adaptation engagé par une équipe de travail lors de l'utilisation d'une nouvelle technologie dont l'usage affecte significativement les routines de travail.

L'adaptation du groupe constitue l'une des thématiques les plus riches et étudiées en SI. Elle a été étudiée selon différentes approches comme la motivation des salariés à collaborer (DiMicco, Millen et al. 2008), le sense-making (DiMicco, Geyer et al. 2009), l'apprentissage organisationnel (Brown and Duguid 1991), les dynamiques de développement de connaissances (Griffith, Sawyer et al. 2003), la proximité perçue (O'Leary, Wilson et al. 2014), le pouvoir des règles (Johnson, Faraj et al. 2014) , le partage de connaissance (Beck, Pahlke et al. 2014) et aussi l'identité du groupe (Ren, Harper et al. 2012).

Nous proposons une autre approche pour étudier l'adaptation du groupe en mobilisant un concept qui, malgré sa pertinence, a reçu relativement peu d'attention, à savoir le concept de 'Performance adaptative du groupe'. Ce concept fait référence au processus entamé par les membres d'un groupe/ d'une équipe au travers duquel ces derniers apportent des changements dans leurs perceptions et comportements ainsi que sur les structures afin de retrouver une situation d'équilibre. Une idée fondamentale de ce concept est que la performance adaptative fait référence à tout le processus et non pas uniquement à des résultats. Ce concept de performance adaptative reste toutefois difficile à cerner empiriquement. Pour ce faire, nous proposons d'utiliser deux concepts comme 'proxy' à savoir *les affordances* (Leonardi and Barley 2008, Leonardi 2011, Leonardi 2013) qui sont constituées lors des interactions entre les individus et la technologie et *la structure d'usage* (Burton-Jones and Gallivan 2007).

Ces deux concepts permettent une compréhension des mouvements adaptatifs engagés par le groupe comme seule entité d'analyse.

Premièrement, les affordances sont les relations d'interaction qui émergent lors de l'interaction entre ce que la technologie offre comme fonctionnalités et ce que les individus perçoivent comme possibilités d'action. Si les individus s'approprient ces affordances, un changement de structure peut avoir lieu (Leonardi 2013). Nous explorons donc quelles affordances ont été constituées entre les membres de l'équipe et la nouvelle technologie avant de les agréger au niveau collectif.

Deuxièmement, la structure d'usage occupe une place centrale entre les technologies et leurs conséquences. A travers ce concept, nous explorons quelle structure d'usage les membres de l'équipe manifestent.

Nous tentons de répondre aux questions de recherche suivantes :

> *QR1 : Quelles affordances sont constituées au cours des interactions entre les membres de l'équipe et la nouvelle technologie ? Quelle est la structure d'usage de la nouvelle technologie?*
>
> *QR2 : Quelles adaptations ont eu lieu au niveau du collectif ?*

Afin de répondre à ces questions, nous adoptons une méthodologie qualitative, inscrite dans une approche réaliste critique. Notre échantillon est l'équipe d'une fondation universitaire, la fondation Dauphine, qui a été confrontée à un changement de technologie affectant significativement les routines de travail de ses membres.

Les données ont été collectées au niveau individuel mais agrégées au niveau du collectif afin de produire des résultats au niveau du groupe.

1.5.3. L'adaptation organisationnelle à la surcharge informationnelle : une perspective par l'apprentissage organisationnel :

Cette étude explique le processus d'adaptation organisationnelle aux changements technologiques survenus dans leur environnement. En mobilisant le concept de 'cadre technologique' (Orlikowski et Gash, 1994), nous tentons de mieux comprendre les changements des cadres technologiques de managers suite au lancement d'une transformation organisationnelle. Plus précisément, nous étudions le cas d'une entreprise qui a lancé un

programme qui remplace l'email par un réseau social d'entreprise. Ce dernier est interprété comme un élément fondamental des changements technologiques survenus dans l'environnement : la percée des technologies collaboratives au sein des organisations.

La thématique des réseaux sociaux d'entreprises a gagné en importance dans la littérature mais beaucoup reste à comprendre sur le sujet. Des thématiques proches ont intéressé les chercheurs en SI comme principalement la collaboration électronique ou la e-collaboration (Riemer, Steinfield et al. 2009) et "online communities" (Kudaravalli and Faraj 2008, Faraj, Jarvenpaa et al. 2011) ; (Ma and Agarwal 2007); (Lee, Vogel et al. 2003) ; (Chen, Xu et al. 2011); (Preece 2001).

Des études récentes ont considéré la nouvelle génération des médias sociaux, notamment les réseaux sociaux d'entreprise, comme suscitant un intérêt particulier vu leurs spécificités. Par exemple, Treem and Leonardi (2012) ont considéré les nouveaux médias de communication (blogs, wikis, social networking sites, micro-blogging, etc.) comme ayant des conséquences différentes comparés aux outils et technologies traditionnels de communication.

Nous explorons les effets d'un réseau social d'entreprise au sein d'une organisation, en mobilisant le concept de système d'apprentissage organisationnel comme cadre théorique. En effet, nous tentons non seulement de voir comment les changements des cadres technologiques des managers se produisent, mais aussi les effets des décisions qui en résultent sur le système d'apprentissage organisationnel.

Nous adressons les questions de recherche suivantes :

> *QR1 : Quels processus les organisations suivent-elles pour engager des actions adaptatives ?*
>
> *QR2 : Quels effets cela a –t-il sur le système d'apprentissage en place ?*

Pour y répondre, nous conduisons une étude de cas réaliste critique. Nous étudions le cas d'Alpha, une organisation dans l'industrie des technologies de l'information, qui a engagé un programme de transformation digitale visant à remplacer l'email par un réseau social d'entreprise. Nous avons conduit des entretiens semi-directifs avec les membres du programme Zéro Email et collecté des documents internes d'Alpha.

Chapter 2 : General Introduction

2.1. Abstract

Despite the variety of literature on 'adaptation to technology', the literature still witnesses a gap concerning the concept of adaptation especially about its multi-level nature. Recognizing the multilevel nature of IS adaptation, we rise the challenge of conducting an alternate template analysis of three cases of adaptation to IS in order to provide complementary explanations about the phenomenon.

In order to expand the comprehension of the 'adaptation' concept, a multi-study dissertation model is adopted. The objective is to examine the adaptation concept on three different levels: the individual, the group level, and the organizational level. This thesis aims at 1) exploring the shaping of individual adaptive actions that knowledge workers engage towards technostress with a focus on the factors that influence their adaptation process; 2) examining the adaptive performance of a group facing an newly-implemented technology based on the adaptive structuration theory (DeSanctis and Poole 1994) under which were puzzled the concepts of affordances (Leonardi 2011, Leonardi, Huysman et al. 2013) and the structure of usage (Burton-Jones and Straub Jr 2006, Burton-Jones and Gallivan 2007); 3) examining, through an organizational learning lens (Argyris and Schon 1978), the case of an organizational adaptation to environmental technological changes examined within a managerial cognition conceptual framework (Orlikowski and Gash 1994); (Bijker 1987, Bijker 1995). To answer the different research questions, the three studies adopt a qualitative approach falling within a critical realist perspective.

2.2. Why studying adaptation with a multi-level approach?

In our three essays, we admit that adaptation is a multi-level phenomenon. They all consider the adaptation process as an effort engaged to adjust the existing situation to the requirements

of the new one. In each one of the three studies, the technological factor constitutes the lens through which we focus attention on how the adaptation process emerges and evolves. In other words, the situations of adaptation that we explore are either triggered or affected by the technological factor.

The mutli-level nature of Adaptation to IS has origins in the definition of an IS itself. According to Mason and Mitroff (1973), an information system represents 'at least a person of any psychological type… (Mason and Mitroff, 1973, p.475) which means that it can take the form of an individual, a group or an organization.

By alternating between models and levels, this thesis is an attempt to uncover the processes of adaptation through which the individual, the group and the organization cope with technological circumstances. Combining several models in bracketing the same social phenomenon on higher and lower-level constructs and analysis offers richer understandings of the phenomenon (Hackman 2003), (Lapointe and Rivard 2007).

The common feature between the three studies is the centrality of the interaction between different actors (knowledge workers within the organizational context, a group within an organization, an organization as an entity) and the technology; an examination that implies the consideration of constructs existing on multiple levels of analysis. In fact, we posited in each of the three studies, research questions dealing with the adaptation process on a different level each time.

In the first study, we focused on the individual level; both data and analysis have concerned the individual level. In the second and third studies, whereby the research questions laid the emphasis on the group adaptation and the organizational adaptation, data was collected on the individual level but aggregated to the group and organizational level in the course of the analysis.

The different definitions of the adaptation constructed through the three studies demonstrate its multi-level nature. We expose them in the table 3 below.

Level	Definition
Individual	A person's cognitive and behavioral efforts to manage specific external and/or internal demands which are appraised as taxing or exceeding the person's resources' (Lazarus and Folkman, 1984)
Group	A change in team performance, in response to a salient cue or cue stream that leads to a functional outcome for the entire team. Team adaptation is manifested in the innovation of new or modification of existing structures, capacities and/or behavioral or cognitive goal-directed actions. (Burke et al., 2006)
Organizational	Modifications and alterations in the organization or its components in order to adjust to changes in the external environment' (Cameron, 1984)

Table 4: Definitions of adaptation across levels.

Although the adaptation construct is conceptualized differently from one level to another, one common characteristic emerges: the interactions between actors (humans or humans and technology).

2.3. Multi-level approach in the IS field:

The IS field explores complex phenomena where the interplay between human actors and technologies constitutes a central focus (Aubert, Barki et al. 2008). The examination of this interplay results in the consideration of constructs existing at multiple levels of analysis because various entities interact and influence each other (Barki, Titah et al. 2007). Two main ideas constitute the basis of this consideration: 1) the interaction between human actors and technologies and 2) the mutual influence of entities under examination leads to the emergence of higher-levels collectives (not only human collectives) which, itself, requires a multi-level lens of study.

Organizational behavior researchers have developed paradigms for multi-level research. In fact, the literature in management has known various perspectives of conducting multi-level

research. They proposed to answer questions such as 1)What constitutes the collective, the micro, the macro? (Morgeson and Hofmann 1999), (Kozlowski and Klein 2000); 2) What relationships to establish between the different levels - also called the models of multi-level research (Chan 1998), (Rousseau 1985) and 3) How to test and analyze entities and variables (Dansereau, Alutto et al. 1984), (Markham, Yammarino et al. 2010).

We uncover each dimension of those proposed earlier.

Regarding the first one, we adopt the idea of the existence of two fundamental levels in multi-level organizational research: the individual (the micro) and the collective (the macro). While the first focuses on the individual's perceptions, beliefs and actions, the second treats larger entities as an aggregation of the micro one. These entities can take the form of dyad, a team/ a group, an organization or an industry. To constitute a collective, the entities of the micro level have to be interacting with each other because the structure of the collective is defined through actions and reactions. The collectives themselves, as open interaction systems, interact with other collectives which results in the emergence of larger collectives (Morgeson and Hofmann 1999).

In the first study, we examine knowledge workers' coping to technostress and the process by which they shape their adaptive actions towards technostress. We thus consider individual actions and adopt a micro level of analysis.

In the second study which focuses on the adaptation of a work-team to a newly-implemented technology, we analyze data collected at the individual level to explain the emergence of a collective behavior. We thus focus on actions on the collective level of analysis.

As for the third study about the case of an organizational adaptation to environmental technological changes, the analysis is conducted on a collective (the organization) level.

The second dimension of the conceptualization of multi-level research concerns the models of the research or the relationships between the different levels. Rousseau (1985) suggested the existence of three types of models: 1) the composition models where there are relationships between independent variables at different levels , 2) the cross level models where there are relationships between dependent and independent variables at the different levels which results in a causality between a phenomenon at one level and another at a different level; and 3) the multi-level models which include the two previous models and posit the generalization of the relationships between dependent and independent variables across two or more levels. Explained differently, Rousseau (1985) has focused attention on the interaction of

independent and dependent variables within and across levels. Rousseau contends that the composition models deal with variables of the same nature at multiple levels of analysis whereas the cross-level and the multiple level models treat different dependent and independent variables at different levels of analysis for the first and aiming to generate generalizations across levels for the second.

Chan (1998) has developed a typology of composition models where he proposed five types of composition models based on the way data was collected at the lower level, and how it has been aggregated to establish higher-level constructs. Positioning our studies within Chan's typology, only the group-level study (Chapter 4) represents interest regarding the second study where data were collected on the individual level and aggregated to the group-level; the level on which the research questions were constructed. The two other studies do not obey to this classification because data were collected on the same level of analysis.

In a recent meta-analysis of the multi-level research in the IS field, Bélanger, Cefaratti et al. (2014), proposed a typology of composition models. They distinguished mono-compositional models from mixed-compositional models. Mono-compositional models, also called traditional models, generally lay emphasis on the examination of one type or one source of entities nesting within larger collective of the same source (eg: nesting people within large collectives of people/ lower -level entities and higher- level entities). This type of models is very present in the organizational studies but does not perfectly fit the multi-level IS research due to a central reason: IS research deals with the interaction between people and technologies either by investigating the relationship of humans and technologies (eg. Research on IT development, initial IS use, continued IS use) or the interaction between humans via technologies (eg. Research on collaboration, knowledge management and sharing enabled by technologies). This specificity of the IS field requires a reconsideration of the place of technologies in the IS multi-level research by giving them the status of 'separate entity' either by examining them separately within a mono-compositional model (eg. Studying the differences in automated decisions (the higher-level entity) between some ERP modules (lower-level entities)) or in a mixed-compositional models (e.g. Studying the differences in people's speed of decision using the same ERP, among the different modules of the ERP).

The three studies that compose our thesis consider mixed models.

while examining the shaping of knowledge workers' adaptive actions towards technostress in the first study , we posit that the actions which individuals undertake using the technology

(their usage of the technology) can constitute sources of stress and that the actions they undertake to adapt to that stress is partly mediated by technologies. Thus, an emphasis was laid on the place of ITs as entities that, added to humans, compose a mixed model.

In the second study, we proposed the examination of a work team's adaptation process towards a disruptive situation (a newly-implemented organizational webmail). While the model of this multi-level research appears to be mono-compositional model because it investigates the emergence of human collective structures and actions (higher-level entities) from individual actions and beliefs (lower-level entities) and thus treats the same source of entities (people nesting within larger human collectives); a deeper thinking would consider it as mixed-compositional model because the IT entity was heavily nested within the group of people because the technology has heavily impacted the team members' communication and coordination processes and had a determinant role in the construction of shared practices.

As for the third study, we also adopted a mixed-compositional model. We examined the case of an organization that implemented a collaborative tool (an enterprise social network) to change the ostensive dimension of its employees' routines (Pentland and Feldman 2005). The ESN was a means to institutionalize the new schematic form of organizational interaction and procedures. The ESN can thus be considered as an entity because it has changed the organization's work practices and structure to conform to the new system.

In the following table 4, we establish a classification of our three studies according to themes of research in the IS field. These themes have been proposed by Bélanger, Cefaratti et al. (2014) as the most recurring research topics examined in the multi-level research within the IS field. Indeed, the multi-level approach has been shown useful in studying these themes.

IS related theme	Description	Related topic of the thesis (# Study)
Continued IS use	Focus on investigating the on-going impacts of IT on individual use behaviors or beliefs	Study #1: Explore the shaping of knowledge workers' adaptation to technostress.
Initial IS use	Focus on the introduction of a system to the end users	Study #2: Analyze the adaptation process of a group with the new technology implemented in the organization.

Collaboration	Focus on the technology as a means of interaction between two or more people pursuing common work goals	Study #3: Study the case of Alpha, an organization that, to adapt to the technological environmental changes, launched a transformation program with an enterprise social network as the focal IT.

Table 5: Topics of the studies

The third and last dimension in the conceptualization of multi-level research consists in not only the identification of entities that can be characterized as whole units or parts but also the establishment of relationships between hypothesized units. In other words, it is required for multi-level researchers to precise if they examine their entities as composed of similar units which represents 'a whole' and thus prove the homogeneity of the units constituting the collective (Klein, Dansereau et al. 1994). Researchers can be in another multi-level type of research and posit the independence of the units forming the collective (Klein, Dansereau et al. 1994). In this case, the level of theory is the unit; and what is valid for the unit is not necessarily valid for the other units of the collective. The third case concerns studies where the level of theory is neither the unit nor the collective but the unit within the collective , coined the heterogeneity by Klein, Dansereau et al. (1994). It is especially used to explore relative effect of individual attributes on the collective. Labeled as the 'heterogeneity' by Klein, Dansereau et al. (1994), this type of multi-level research is the less common one in organizational studies.

Following this principle, it should thus be acknowledged that we ensured, in each study of ours, that the units under investigation fall within the first configuration.

Regarding the first study, we collected our data across knowledge workers who rely heavily on ITCs in performing their work. Each knowledge worker constitutes a unit, and thus belongs to the community of knowledge workers by holding that status. Knowledge workers constitute a whole.

The second study that investigates the adaptive process of a team to a new technology also obeys to the same principle because we collected data across parts (the team members) and aggregated analysis on the level of the 'whole' (the team) as our unit of analysis.

Finally, the third study considers the organization as a 'whole' and data were collected among the team that was leading the transformation project because they are representative of the organization.

2.4. Ontological and Epistemological Positions of the Thesis: Critical Realism

In this thesis, we adopt critical realism as the meta-theoretical position that holds realist ontological assumptions and relativist epistemological assumptions (Archer et al., 1998; Bhaskar, 1979). These assumptions assume a specific consideration of the 'world' and the construction of human knowledge. In fact, critical realists are called realists because they strongly believe in the ontology of the existence of an objective reality and in the independence of the world from the knowledge that humans hold of the world. This idea posits itself against what classical positivists consider of the restrictiveness of the world to the mere fact which can be empirically observed and measured and against the pure constructivists positing that the world is nothing other than the knowledge that humans hold about it. Critical realists are called critical because they believe that the reality is perceptible and is likely to be known and understandable but holding that the access to this reality is always mediated by perceptual and theoretical lenses. Critical realists also advocate the capacity of humans to access the world because they are endowed with the faculty of reasoning and thus are critical in a Kantian sense.

The reality, according to critical realists, is not only intransitive but also stratified in two ways (Archer, 1998). The first stratification resides in the relationships between three domains: the mechanisms, the events they generate and the subset of events that is experienced. The mechanisms, for critical realists, represent the domains of '*the real*' where are also found the events and the experience representing the whole reality. The domain of '*the actual*' only consists of the events occurring (or not) in the real sphere, itself including the domain of '*the empirical*' which is restricted to the events which are observed and/or experienced.

The second stratification resides in the following idea: In the realm of objects, causal powers at one level can be examined as generated from those of lower level through 'the emergent powers materialism' (term of Bhaskar), which means that in the domain of the real, there are complex interactions between systems that are open, stratified and dynamic, material or non-material and where particular structures lead to certain causal powers, tendencies and ways of

acting. These particular structures are called ‘generative mechanisms’ by Bhaskar (1979) because they generate the sphere of ‘*the actual*’.

The critical realism has been of a growing interest in the IS field in that it enables a shift in researchers’ focus from data and methods of analysis to deeper examinations of phenomena and their causes. Critical realism represents a framework for using various methods to gain a better understanding of phenomena. Indeed, a recent special issue of MISQ (September 2013) proposed ‘*a discussion of critical realism as a philosophy of science and its extensions into the social realm*’ and proposed papers that deal with the critical realism theory, methodological challenges, and applications.

As for our three studies, we consider that we adopted a critical realism perspective because we focused attention on the emergence of phenomena which is a central concept of the critical realism position.

In the first study, we explored the shaping of individuals’ adaptive responses to technostress and thus centered attention on the construction of the adaptive action on one hand and searched for contextual factors that influence its generative mechanism on the other.

In the second study, we analyzed the processes by which a group adapted to a newly-implemented technology which is focal to their work. We laid the emphasis on the emergence of the team members’ appropriation moves by mobilizing the ‘affordances’ concept.

The third study exposes the case of an organization that, seeking to respond to environmental changes, engaged in a transformation program. To analyze this case, we mobilized a concept which falls into the critical realism perspective, with a view to knowing the ‘technological frames’ referring to the mental models that people hold about the technology. As we analyzed the shift that the managers have experienced concerning the best communication and coordination technology to be used in their organization, we directed attention on the emergence of new technological frames. We also analyzed how the new technological frames affected the organizational learning system in place.

2.5. Overview of the multiple studies

	Study #1	Study #2	Study #3
Unit of Analysis	Individual	Group	Organizational
Research Questions	RQ 1: How do technology and work context -related perceived misfits contribute to technostress? RQ 2: How do knowledge workers respond to technostress?	RQ 1: Which affordances are constituted in relationships between team members and the new tool? RQ 2: What adaptations occur when the group migrates from the old tool to the new one?	RQ 1: How do organizations engage adaptive actions when facing technological environmental changes? What process do they follow in doing so? RQ 2: To what extent can organizational adaptation be considered as a process of organizational learning?
Key Concepts	Individual adaptation, Technostress, Technology and Environment-related triggers, Coping	Adaptive team performance, Appropriation moves, Affordances, Structure of use,	Organizational adaptation, Technological frames, Organizational learning system, Attention to change
Methodological Approach	Grounded Theory (20 interviews)	Critical realist research (10 interviews)	Critical realist case study (10 interviews)
Field	20 Knowledge workers from different companies and industries	Dauphine's foundation team members (10 semi-structured interviews)	The case of Alpha, an information technology organization launching the Zero Email program (10 semi-structured interviews)
General propositions	Towards technostress, knowledge workers engage an adaptation process. The adaptive action they engage is influenced by different factors.	In order to adapt to the newly-implemented technology that alters their routines, the team members rely on their perceptions of the organization's structures, the team climate they work in and the characteristics of the task they perform. Through the mobilization of the 'affordances' and 'structure of use' concepts as proxies for the adaptive team performance, the team adaptation process is analyzed.	Faced to technological environmental changes, organizations experience shifts in the technological frames in use and engage an adaptation process through adaptive adjustments. The adaptation moves the organization engage influence the learning system in use. Attention is focused on the change at the level of the organizational learning system

Table 6: Overview of the three studies.

2.5.1. Exploring knowledge workers' adaptation to technostress: a misfit perspective:

This first study raises a gap in the IS literature: how do individuals cope with technostress. Our main objectives are 1) to review the literature on technostress and propose a different conceptualization of its triggers, and 2) investigate the process of the emergence of the adaptive response knowledge which workers engage towards these disruptive states. We also focus attention on the different factors that influence their adaptation moves.

This study aims at answering several calls within the IS literature to study the drawbacks of IT investments within organizations. In fact, despite of the benefits ICTs offer to organizations, many challenges are to be considered such as Technostress referring to the inability to cope with organizational computer usage. Knowledge workers are the first consumers of these ICTs and rely heavily on them to perform daily tasks. They are thus continuously exposed to states of technostress which lead to a need for continuous adaptation.

In response to those challenges, academia and IS literature in particular have been interested in close phenomena such as job burnout (King and Sethi 1997), (Pawlowski, Kaganer et al. 2007) or computer anxiety (Fuller, Vician et al. 2006), (Thatcher and Perrewe 2002) since the seminal work of Brod (1984). In the course of two decades of research on Technostress defined as 'the stress caused by an inability to cope with the demands of organizational computer use' (Tarafdar, Bolman Pullins et al. 2014), IS researchers have advanced various theoretical perspectives and methodological developments of the concept.

However, the field of research on the dark side of IT use, and more precisely technostress, is still in early and fragmented stages of study (Tarafdar, Bolman Pullins et al. 2014, Tarafdar, DArcy et al. 2015), (D'Arcy, Gupta et al. 2014). Indeed, the literature, especially leading IS journals, still witnesses a lack of studies that add to the existing insights in a way that strengthens the body of research on this area. According to a recent review of the IS literature on the dark side of organizational IT usage, the IS basket counted only 37 articles that studied negative effects of IT usages between 1995 and 2005 (Pirkkalainen and Salo, 2016)

We thus propose a different approach to investigate technostress triggers by looking for contextual misfits that knowledge workers perceive in their work environment and hence interpret as disturbing their equilibrium. We posit that technostress is the strain triggered by a difficulty and/or failure of reaching a fit between knowledge workers' needs and what ICTs

are expected to offer as capabilities. In fact, while ICTs are supposed to answer specific organizational needs of information integration, easier access and share of information, enhanced productivity and efficiency; knowledge workers, the first consumers of ICTs, face a different reality characterized by increasing difficulties to manage these technologies and take full advantage of their usage in a way that helps them reach their objectives and ensure organizational growth. They indeed happen to be in a situation of continuous misfit between what has been expected to change with the ICTs and what the organizational reality is. This situation results in feelings of technostress.

Yet, the area of how to cope with technostress is still unexplored. More precisely, little do we know about the cognitive processes of adapting to technostress and how adaptive acts are constituted. IS researchers have advanced interesting definitions of individual adaptation. For example, the concepts of appropriation (Poole, Homes et al. 1988, DeSanctis and Poole 1994), reinvention (Rice and Rogers 1980), (Leonard-Barton 1988), adjustments (Majchrzak and Cotton 1988), and coping (Beaudry and Pinsonneault 2005) somewhat encompass the individual adaptive process, whereby individuals may act on the technology, their work and themselves (DeSanctis and Poole, 1994, Beaudry and Pinsonneault, 2005). Another interesting approach to adaptation is the coping approach. This approach has been applied in IS through the coping model of user adaptation (Beaudry and Pinsonneault, 2005).

Thus, a gap resides in the understanding of individual adaptation to technostress. Though being very interesting, the previous conceptualizations do not totally fit our consideration of individual responses to technostress, which, rather than being a punctual event, are a continuous state that workers experience. Therefore, the way individuals adapt to technostress is likely to differ from the way they adapt to punctual and disruptive events. Hence, a more emergent approach to adaptation is necessary for understanding how people cope with technostress.

This paper is thus an attempt to answer two research questions that we raise.

> *RQ1: How do technology and work context-related perceived misfits contribute to technostress?*
>
> *RQ 2: How do knowledge workers respond to technostress?*

Adopting a grounded theory research methodology, we conducted 20 interviews with knowledge workers from different organizations and industries aiming at getting insights into both the misfits that knowledge workers experience triggering technostress, and the adaptation paths they engage with the different factors influencing this trajectory.

The data collection was undertaken in the context of Paris-Dauphine University (Paris, France) where we approached MBA students. The sample of informants comprises 22 managers from different corporations (Insurance companies, public services, software editors…) who heavily rely on ICTs in performing their daily tasks. First, we approached the class of MBA via the e-mailing list of the MBA Department, explained the topic of our research and stated our intention for conducting interviews. We contacted the class members who positively answered to set up dates and hours for interviews. As we followed a grounded approach, we conducted semi-structured interviews during which we focused on understanding how the knowledge workers assess their stressful working environment through exploring what, to their view, triggers feelings of technostress and what factors they consider when responding to it. Interviews lasted 1 hour in average and were conducted in both participants' work offices and elsewhere. Interviews were tape recorded with the agreement of participants.

2.5.2. Adaptive team performance: an affordance and structure of use perspective

In the second study, we propose to explore the process by which a team adapts to an organizational technological change.

In fact, team adaptation remains one of the richest topics in research. The IS literature has known a variety of theoretical concepts posited in studies of group adaptation. Relevant concepts include employee motivations to collaboration (DiMicco, Millen et al. 2008), sense-making (DiMicco, Geyer et al. (2009), organizational learning (Brown and Duguid (1991), dynamics of knowledge development (Griffith, Sawyer et al. (2003), perceived proximity (O'Leary, Wilson et al. (2014); power laws (Johnson, Faraj et al. (2014); knowledge exchange (Beck, Pahlke et al. (2014), as well as group identity and interpersonal bonds (Ren, Harper et al. (2012).

To assess the process of adaptation that the team has engaged we mobilized the concept of 'Adaptive Team Performance' which refers to the team's members undertaking a process whereby they change their cognitive or behavioral goal-oriented actions or structures. The central assumption is that performance does not only reside in the result of the action but rather in the unfolding of the action itself. However, little is known about 'adaptive team performance' that focuses on the longitudinal enactment of the adaptation processes rather than the outcomes of the team's adaptive action.

We propose to add to the comprehension of this concept through the examination of the processes that the team's members exhibit while confronting the new information technology which has the potential to substantially alter their routines.

More precisely, we propose to draw on the appropriation moves that constitute the adaptive performance of the team by mobilizing two central concepts: *the affordances* (Leonardi and Barley 2008, Leonardi 2011, Leonardi 2013) that are constituted in relationships between team members and the new information technology and *the structure of its use* (Burton-Jones and Gallivan 2007). We opted for mobilizing these two concepts as proxies of the adaptive team performance.

In fact, the relational view of affordances implies considering a relationship between the technology's features, the affordances they offer and the effects (the usage and what results from it) they produce. It is suggested that users, only when they perceive that the technology features offer to them affordances of actions, would they appropriate certain features that, if not appropriated, could not afford a social structural change (Leonardi 2013).

As far the structure of use is concerned, it constitutes a proxy through which elements about the technology impacts can be more effectively assessed. System usage thus occupies a central place between the IT artifacts and their consequences.

We analyze how a group's members within an organization, adapt their work to the capabilities offered by the new information technology: a new webmail to support communication and coordination. We consider the group as a collective that constitutes the unit of analysis.

We seek to answer the following research question:

> *RQ 1: Which affordances are constituted in relationships between team members and the new tool? What is the structure of use of the new technology?*
>
> *RQ 2: What adaptations occur when the group migrates from the old tool to the new one?*

In doing so, we rely on the concept of 'teams' shared mental models' to explain how common models about the technology and the team interaction influence the team's adaptation. We also mobilize the concept of 'team's transactive memory' to explain the influence of members' role specialization on the adaptation process.

To answer our research questions, we opted for a critical realism case study. Such an approach is considered as the primary research design under the critical realism paradigm (Wynn Jr and Williams 2012). Indeed, it enables IS researchers to develop in-depth causal explanations of the outcomes of a specific socio-technical phenomenon with a focus on the interplay of social, organizational, environmental factors with information technology and the role they play in the occurrence of phenomena. Markus and Silver (2008) advocate the use of the critical realism paradigm to search insight into and test the role of IT use.

We opted for Dauphine Foundation, a university foundation as a field. The university of Paris-Dauphine launched a program of webmail system renewal and the decision has been made to implement such a system and migrate to the new webmail called 'Webmail Partage'. We focus on how the team of 'Dauphine Foundation', a service specialized in promoting the university image operated and coped with the new tool.

In fact, Dauphine Foundation was the last group within the university to migrate to 'Partage' which would have effects on their migration process and on the way they have perceived this transformation. As the entire structure (the University) already migrated, the foundation's members' behaviors would have been influenced by context-related factors which seemed an interesting case to study.

Data were collected using semi-structured interviews. After contacting the administrative assistant of the foundation and conducting an exploratory interview with her, she was convinced of the interest of the topic and launched a request for participation to the entire group through the mailing list of the foundation.

2.5.3. Organizational adaptation to information overload: an organizational learning perspective

In this study, we trace one firm's adaptation to shifts in its technological and industry environment. Mobilizing the notion of 'technological frames' (Orlikowski and Gash 1994), we explore how senior managers' cognitions about the role of ESN technology evolved,

looking through an organizational learning lens. Specifically, we focus on the firm's launch of a 'Zero Email' initiative, whereby workers were expected to substitute a new ESN technology, replacing all email communication.

The focus on studying ESN is grounded on our recognition that there is a lack of studies about ESN in the IS literature. While related topics, such as e-collaboration (Riemer, Steinfield et al. 2009) and "online communities" (Kudaravalli and Faraj 2008, Faraj, Jarvenpaa et al. 2011); (Ma and Agarwal 2007); (Lee, Vogel et al. 2003); (Chen, Xu et al. 2011); (Preece 2001), have received attention in the literature, the newer generation of social media tools (here labeled as ESN) have yet to draw much attention.

Recent studies have proposed the notion of ESNs as a new generation of communications tools to support work teams. For example, Treem and Leonardi (2012) have argued that social media technologies (blogs, wikis, social networking sites, micro-blogging tools, etc.) exert different effects on employee communication compared to traditional computer-mediated-communication (CMC) tools (Grudin 2006), (McAfee 2006), (Steinhuser, Smolnik et al. 2011).

Indeed, the theoretical concepts posited in studies of older technologies may serve as a useful baseline to explore the newer tools. Researchers have mobilized relevant concepts to study the impact of technology on organizational work such as employee motivations to collaborate (DiMicco, Millen et al. (2008), sense-making (DiMicco, Geyer et al. (2009), organizational learning (Brown and Duguid (1991), dynamics of knowledge development (Griffith, Sawyer et al. (2003), perceived proximity (O'Leary, Wilson et al. (2014); power laws (Johnson, Faraj et al. (2014); knowledge exchange (Beck, Pahlke et al. (2014), as well as group identity and interpersonal bonds (Ren, Harper et al. (2012).

Accordingly, this study addresses the theoretical gap surrounding the link between organizational adaptation and learning from a managerial cognition lens. Indeed, we posit that mobilizing the organizational learning frame of analysis, would add to the IS literature about the comprehension of the usage of ESN in organizations and the impacts of integrating such tools in the organization's processes.

Our study explores the adaptive process through which managers decided to adopt an ESN, in response to the shifts they have known in their technological frames, and how it has affected the organization's learning system. We combine two streams of research: managerial/ social cognition and organizational learning.

We aim to answer the following research questions:

RQ 1: How do organizations engage adaptive actions, when facing technological environmental changes? What process do they follow in doing so?

RQ 2: To what extent can organizational adaptation be considered as a process of organizational learning?

The case study was undertaken in Alpha, an information technology company. Since 2011, Alpha has set out a step towards leading the flow of organizational engagement of solutions with a view to minimizing/ alleviating the drawbacks of the phenomenon of information overload. The solution Alpha undertook is to act as a 'Zero Email' company by the year 2013. Alpha presented the program as' *the Zero Email program is a key pillar of the internal 'Well-being @ work' initiative. Its aim is to transform towards a social, collaborative enterprise where we share knowledge and find experts easily in order to respond to clients' needs quickly and efficiently, delivering tangible business results. First and foremost this requires a cultural change, learning new behaviors and management styles*'.

To collect data we used semi-structured interviews. This has been undertaken after requesting an interview with the Zero Email Program director and introduction of the frame and purpose of the study. The program director then launched a survey for people willing to participate. Interviews were then conducted with the program's members. For the second round of interviews, we followed a snowball sampling strategy. In that, every interviewee was asked to potentially communicate names of people who would likely be interested in the study. This has been crowned with 10 conducted interviews.

Data were collected during May and June 2014. The interviews lasted 1h15 in average Some interviews were conducted in Alpha's Headquarters, other were conducted via Skype with the Zero Email program members in other countries rather than France.

Chapter 3 : Exploring the Mechanisms of Knowledge Workers' Adaptation to Technostress: A Misfit Perspective

3.1. Introduction

> *New technologies can certainly be considered as an enrichment of tools that modern workers dispose of […]. The flip side is the increasing psychological load that occurs when IT-enabled possibilities turn to be source of pressure, regarding either the management the peers or customers' expectations, as well as the individual pressure felt as a techno-dependence.* (Jan Pompa– Report for the European Trade Union (2013)

Despite the advantages that organizations draw from investing ICTs as enabling continuous and easier access to data and information, towards better decision making and higher productivity and performance; the usage of these technologies hides considerable challenges. A number of reports based on alarming statistics pointed out the negative impacts of these investments on workers' well-being and stress at work with a focus on the impact of the technological dimension of modern work. Tarafdar et al. (2015a), referred to the negative effects of IT organizational usage as '*the dark side of IT use*' and described it as "*collection of 'negative' phenomena that are associated with the use of IT, and that have the potential to infringe the well-being of individuals, organizations and societies*" (Tarafdar et al., 2015a, p. 161).

In response to those challenges, academia and IS literature in particular have been interested in close phenomena such as job stress, job burnout, computer anxiety and technostress defined as 'the stress caused by an inability to cope with the demands of organizational computer use' (Tarafdar et al., 2014). During two decades of research on Technostress, IS researchers have advanced various theoretical perspectives and methodological developments of the concept.

While the first studies on technostress hark back to 1984 (Brod 1984), the IS field in particular has known an increasing number of studies on technostress since 2007 with Tarafdar's seminal works. Researchers on technostress have advanced definitions and investigated technostress creators, components and outcomes. For example, Ayyagari, Grover et al. (2011) explored the technology characteristics that cause stressors leading to technostress (considered as a strain). Shu, Tu et al. (2011) focused on computer self-efficacy and technology dependence as its antecedents. Regarding the outcomes, Tarafdar, Tu et al. (2007) have emphasized the influence of technostress creators on users' productivity and role

conflict. The same authors assessed in 2010 the impact of technostress on end user's satisfaction and performance.

Nonetheless, the field of research on the dark side of IT use and more precisely technostress is still in early and fragmented stages of study (D'Arcy, Gupta et al. 2014), (Tarafdar, Bolman Pullins et al. 2014, Tarafdar, DArcy et al. 2015). Indeed the literature, especially leading IS journals, still knows a lack of studies that add to the existing insights in a way that strengthens the body of research on this area. According to a recent review of The IS literature on the dark side of organizational IT usage, the IS basket counted only 37 articles that studied negative effects of IT usages between 1995 and 2005 (Pirkkalainen and Salo, 2016)

We thus propose a different approach to investigate technostress triggers by looking for contextual misfits that knowledge workers perceive in their work environment and interpret as disturbing their equilibrium. We posit that technostress is the strain triggered by a difficulty and/or failure of reaching a fit between knowledge workers' needs and what ICTs are expected to offer as capabilities. In fact, while ICTs are supposed to answer specific organizational needs of information integration, easier access and share of information, enhanced productivity and efficiency, knowledge workers, the first consumers of ICTs, face a different reality characterized by increasing difficulties to manage these technologies and take full advantage from their usage in a way that helps reach objectives and ensure organizational growth. They indeed find themselves in a situation of continuous misfit between what has been expected and what the organizational reality which leads to technostress.

Yet, the area of how to cope with technostress is still unexplored. More precisely, little do we know about the cognitive processes of adapting to technostress and adaptive acts are constituted. IS researchers have advanced interesting definitions of individual adaptation. For example, the concepts of appropriation (Poole and DeSanctis, 1988, 1990 and DeSanctis and Poole, 1994), reinvention (Rice and Rogers, 1980; Leonard-Barton, 1988), adjustments (Majchrzak and Cotton, 1988), coping (Beaudry and Pinsonneault, 2005) somewhat encompass the individual adaptive process, whereby individuals may act on the technology, their work and themselves (DeSanctis and Poole, 1994, Beaudry and Pinsonneault, 2005). In those cases, adaptation is seen as a '*the way users respond to changes or disruptions induced by IT* (Beaudry and Pinsonneault, 2005, p.496). Another interesting approach to adaptation is the coping approach. This approach has been applied in IS through the coping model of user adaptation (Beaudry and Pinsonneault, 2005), which suggests that individual coping strategies

to stressful IT events results from two appraisals. That of the threats / opportunities related with a disruptive IT event and that of the control of individuals over the IT, their work and themselves.

Thus, a gap resides in the understanding of individual adaptation to technostress. While very interesting, the previous conceptualizations do not totally fit our consideration of individual responses to Technostress, which, rather than being an episodic, punctual event, is a continuous state that workers experience. Therefore, the way individuals adapt to technostress can be expected to differ from the way they adapt to episodic, disruptive events. For this, a more emergent approach to adaptation is necessary for understanding how people cope with technostress.

This paper is thus an attempt to answer two research questions that we raised.

> *RQ1: How do technology and work context-related perceived misfits contribute to technostress?*
>
> *RQ 2: How do knowledge workers respond to technostress?*

The remainder of this paper is structured as follows. We first review the literature about technostress, its definitions, its determinants, its outcomes to point out what lacks to the existing conceptualizations. Accordingly, we draw on the literature on technostress to assess which misfits within or outside the organizational settings result in feelings of technostress and investigate adaptation to technostress as a continuous, rather than punctual process.

Further, we draw on the various conceptual developments and models of coping theory to propose our view to adaptation to technostress. A focus of attention will be put on the influence of institutional, social and individual factors on shaping the beliefs of individuals towards technology adaptation. Before exposing our results, we detail our methodological approach that is Grounded Theory within an interpretive emergent perspective. We then conclude by discussing our results and pointing out the theoretical and managerial contributions of this study.

3.2. Literature Review

3.2.1. Technostress

Stress as a background to technostress

Within academia, researchers have approached the concept of stress from various perspectives. Some consider stress as the negative response to disturbing factors in the environment. Called strain, the response, , can be either psychological or physiological (Levi (1974). Other researchers have examined the phenomenon of stress by studying characteristics of the stimuli of negative stressors (Welford (1973).

A well-known model of stress is the Person-Environment (P-E) Fit model. Such a model posits that equilibrium exists between people and their environment. Any disequilibrium between people and their environment is likely to result in strain (Cooper, Dewe et al. 2001), (Edwards and Cooper 1988). Stress results from the way people cognitively interpret their environmental demands. If a misfit between environmental demands and individual capacities to face them is perceived, stress is thus likely to occur. The greater the misfit is , the more stressful the situation becomes for the individual (Cooper, Dewe et al. 2001). According to this view, outcomes of stress, are mainly psychological and can only be measured subjectively through individual perceptions of occupational demands (Fox, Dwyer et al. (1993).

Stress has as well been studied from an epidemiologic perspective (Fox, Dwyer et al. (1993). Such a perspective considers stress as a disease resulting from occupational conditions like work overload. It distinctly differs from the P-E Fit model because it is argued that both factors contribute to stress and its outcomes are objective and independent of the person.

However, an agreement about viewing stress as a phenomenological process combining both perspectives (Lazarus (1990) is more available in research. The “transactional approach to stress”, initiated by Lazarus (1966), views stress as a process which involves continuous interactions and adjustments, or “transactions”, between the person and the environment (Lazarus 1966, Lazarus and Folkman 1987). Stress is defined as “the psychological state which derives from people’s appraisals to their adaptation to the demands which are made of them” (Lazarus (1966). The individual, here, is considered as an active agent who can influence the impact of a stressor through behavioral, cognitive and emotional strategies. A central feature of the transactional approach to stress is the process of cognitive appraisal.

This is a mental process by which people assess whether a demand threatens their well-being and appraise their resources to meet the demands. There are two processes involved: primary appraisal which yields a judgment of the event as being irrelevant, positive or stressful. Three implications stem from events that are appraised as stressful: harm-loss, threat, and challenge. Following this process, secondary appraisal begins. It refers to the assessment of resources available to engage coping.

In this study, and in line with our interest in both stress and adaptation, we rely on Lazarus (1966) transactional approach to stress. In fact, the basic claim of Lazarus' approach to stress resides in the consideration of stress as resulting from transactions between individuals and aspects of their environment and that stress is not inherent to the person nor is it a property of his/her personality or a characteristic of the environment. It is basically the way individuals interact with their environment leading or not to perceive/feel stress. As this approach has its roots in cognitive theories, the primary and secondary appraisals are central elements.

Indeed, the primary appraisal (called also first appraisal) aims at determining if any personal stake exists to the encounter (the stressors) (Lazarus, 1993, p.3) and at considering the encounter congruence or incongruence. In other words, individuals aim at evaluating what influence the transaction (the interaction between the individual and his/her environment) has on the individual goals (Facilitates or constrains) (Smith and Lazarus, 1990). We adopt this argument to claim that knowledge workers proceed at a first time to evaluate the causes and triggers of technostress; that is the encounter.

As for the secondary appraisal, the transactional model of stress proposes that individuals focus on the coping possibilities and choices that would alter the situation to regain mastery over it. Thus, we consider that adaptation represents a set of transactions that knowledge workers undertake within their environment and within specific frames.

Research on Stress and Technostress

Defining Technostress

The concept of technostress became popular in the early 1980s when ICTs began to proliferate and computers to appear (Clark and Kalin 1996). Since then, it has become commonplace for individuals to constantly use ICTs both in their private and in work life. While ICTs are assumed to be productivity boosters, increasing workers' efficiency and

effectiveness (Hitt and Brynjolfsson 1996), (Dos Santos and Sussman 2000), (Kudyba and Diwan 2002), findings from academic literature and press have revealed that ICTs are also responsible for increased stress levels among individuals. This phenomenon is known as 'technostress' (Ragu-Nathan, Tarafdar, Ragu-Nathan, & Tu, 2008; Tarafdar et al., 2007). Technostress has been defined in different ways in the literature. Definitions range from defining it as a general disease of adaptation that expresses an inability to cope with new computer technology (Brod, 1984) to a simple assessment of the negative impacts of technologies on the individual attitudes and behaviors (Weil and Rosen, 1997) or further the state of being dependent on technologies (Brillhart 2004).

More recent studies have either reused existing definitions (Ayyagari, Grover et al. 2011), (Srivastava, Chandra et al. 2015) or developed new ones insisting on the digital transformation that organizational environment has known over the years leading to the ubiquity, the complexity and the proliferation of ICTs and a greater exposure of knowledge workers to them. For example, Tarafdar et al. (2007) and Ragu-Nathan et al. (2008) suggest that technostress can be divided into the following components: techno-overload / techno-invasion/ techno-complexity/ techno-insecurity/ techno-uncertainty. Stated differently, Brillhart (2004) advances four types of technostress: the data smog (information fatigue syndrome/information overload), multi-tasking madness, computer hassles and burnout.

In parallel, researchers have focused on developing measures of the concept. Most known scales were developed by Tarafdar et al., 2007 and Raghu-Nathan et al., 2008.

The following table 7 presents a summary of how technostress is defined in the literature:

Author (Year)	**Proposed Definition**
Brod (1984)	A modern disease of adaptation caused by an inability to cope with new computer technologies in a healthy manner.
Weil and Rosen (1997)	Negative impact on attitudes, thoughts, behaviors or body physiology that is caused either directly or indirectly by technology.
	Our reaction to technology and how we are changing due to its influence.
Arnetz and Wiholm (1997)	A state of arousal observed in certain employees who are heavily dependent on computers in their work
Brillhart (2004)	Personal stress generated by reliance on technological devices, a panicky feeling when they fail, a state of near-constant stimulation, or being constantly 'plugged-in'.

Wang, Shu et al. (2008)	Any negative effect on human attitudes, thoughts, behaviors and psychology that directly or indirectly results from the use of computer-based ICTs.
Tu, Wang, and Shu (2008)	A ‘‘reflection of one’s discomposure, fear, tenseness and anxiety when one is learning and using computer technology directly or indirectly that ultimately ends in psychological and emotional repulsion and prevents one from further learning or using computer technology.’
Tarafdar, Tu et al. (2007)	A kind of fallout of an individual's inability to deal with constantly evolving ICTs and the changing cognitive and social requirements related to their use.
Tarafdar and Tu (2010)	The phenomenon of stress caused by an inability to cope with the demands of organizational computer usage.
Ayyagari, Grover et al. (2011)	Uses Brod’s definition “A modern disease caused by one’s inability to cope or deal with ICTs in a healthy manner” (uses the concept interchangeably with: stress in the workplace and ICT-induced stress)
Shu, Tu, and Wang (2011)	Use Weil and Rosen’s definition “negative impact on attitudes, thoughts, behaviors, or body physiology that is caused either directly or indirectly by technology.
Salanova, Llorens et al. (2013)	A specific type of stress related to the use of ICT, mostly resulting from the high speed at which technological change takes place
Riedl (2012)	Uses Brod’s definition.
D'Arcy, Herath et al. (2014)	Employees’ stress–related to the use of information technology.
Tarafdar, Bolman Pullins et al. (2014)	Stress caused by the use of IS in the workplace.
Tams, Hill et al. (2014)	A novel approach to study technostress through neuro-science as a physiological data. Does not present a definition of technostress. (It relies on Riedl’s review, 2013)
Tarafdar, DArcy et al. (2015)	Stress that users experience as a result of their use of Information Systems (IS) in the organizational context.
Srivastava, Chandra et	Uses Tarafdar and Tu (2010) definition.

al. (2015)	
Chen (2015)	Use Weil and Rosen's definition "negative impact on attitudes, thoughts, behaviors, or body physiology that is caused either directly or indirectly by technology.
Chen and Muthitacharoen (2016)	Use Weil and Rosen's definition.

Table 7: Definitions of Technostress in the IS literature.

Close concepts to Technostress: Computer Anxiety & Job Stress

Prior research has also been examining other concepts close to technostress, which may create confusion when used interchangeably. Those concepts are "Computer Anxiety" and "Job stress".

Technostress & Computer Anxiety: While computer anxiety refers to '*A fear of computers when using one, or fearing the possibility of using a computer'*, technostress always refers to the fallout related to an individual's *inability* to deal with constantly evolving ICTs and the changing cognitive and social requirements related to their use (Tarafdar, Tu et al. 2007). This phenomenon of computer related technostress is also very different from the earlier stress generation caused by automation (Shu, Tu et al. (2011). The major difference between the two concepts is that the automation-related stress, which is more likely to only occur in the work place, may not be as intertwined with one's life outside of work (Karuppan (1997), Smith and Carayon (1995) as technostress. Some researchers argue that increasing computerization within the office work environment has further increased the levels of stress among workers (Kinman and Jones (2005), Korunka and Vitouch (1999)). Other researchers contented that this increase in the levels of stress is actually due to heavier workloads (Åborg and Billing (2003), Sandblad, Gulliksen et al. (2003).

Technostress & Job stress: Technostress also differs from job stress. The literature about job stress has identified different factors that constitute sources of strain within the work environment. Strain refers to the individual psychological response to the stressors. In this respect, job stress is a more general concept than technostress. While job stress encompasses

the various stressors that may exist within the work environment, technostress examines how some stressors are enhanced by the use of the technology. Job stress literature categorizes stressors into seven categories (Cartwright and Cooper 1997): characteristics of the job, role characteristics, organizational factors, career concerns, relationships within the organization, work–home interface, and invasion of privacy (Malhotra, Kim et al. 2004).

Theoretical bases of Technostress Studies

IS researchers who are interested in technostress mobilized various theoretical foundations as bases for their conceptual development. For example, Ayyagari, Grover et al. (2011) mobilized the Person Environment Fit Model (PEF) to investigate the different stressors leading to technostress. Ragu-Nathan, Tarafdar et al. (2008) and Tarafdar et al. (2015) used the Transaction Theory of Stress to search technostress creators and their effects on organizational commitment and IT enabled innovation. Tarafdar et al. (2007) studied technostress creators and their effect on productivity and role stress through the socio-technical theory and role theory lens. In order to investigate the effect of IT use on job performance, living) and wellbeing, Pawlowski, Kaganer et al. (2007) used social representations theory. On the another hand, Koch et al. (2014), mobilized boundary theory and the theory of positive emotions to prove that IT use is an antecedent to technostress in organizational and professional contexts.

Determinants of Technostress

Overall, prior research on technostress has identified various characteristics of technology use, which may make technostress independent of other work-related or automation-related stress. Shu, Tu and Wang (2011) explained that modern computer technology is not only deeply integrated into workers' lives, bringing down the walls between work and home life, but also that computer-based ICTs are advancing at an unprecedented rate. It thus imposes a tougher demand for employees to keep up with the ever-growing technology. Additionally, employees are dealing with large amounts of information – often more than they can process, due to the spread of ICTs in all components of organizations and across the prevalence of the internet. In those contexts, individuals experience technostress because of human cognitive limitations and their inability to adapt to the frequent changes in technology, which may generate negative impacts on effective ICT use and individual productivity (Shu, Tu and Wang, 2011).

The use of ICTs has additionally been considered as producing a perpetual state of urgency and creating the expectation that people need or are entitled to work faster (Hind, 1998). All this further occurs in a context where businesses have become increasingly globalized facing an increasingly tough competitive environment. This context has contributed to create lean organizations with *reward* cultures, for example leading to rewarding people who work hard, spend longer hours at work and are always connected to the organization (Spruell 1987).

Yet, the majority of research on Technostress determinants does not explicitly present a formal typology of the factors that create technostress. While the common basis still considers technostress as resulting essentially from failures in coping with ICTs, the boundaries between technological, managerial, organizational ad work-environment are still blurred. Ragu-Nathan et al., (2008), for example, do not advance specific classification of technostress determinants. They combine both technological and work environment creators of technostress in one set of determinants as indicated in the following table 6:

Technological & Work Environment Determinants of Technostress	- Enormous and increasing dependence of managers on ICTs (such as personal computers, enterprise applications, manufacturing applications, collaborative applications, and connectivity tools) - Constant introduction of updated versions of software and hardware. - The ever-increasing sophistication of ICTs, there is often a significant difference between the knowledge needed to perform various tasks using ICTs and the level of such knowledge among workers and managers. - Modern ICTs have changed the work environment and culture. - ICTs come with increased possibilities for remote supervision, multitasking, social isolation, and abstraction of work. - ICTS have eliminated the conventional workday and have made time and distance immaterial to the execution of many organizational tasks.

Table 8: Technological and work environment creators of technostress (adapted from Ragu-Nathan et al., 2008)

In undertaking the literature review on technostress we aimed at identifying different types of technostress determinants. We identified two sets of determinants, technological and work environment.

Technological determinants of Technostress

The first set of technostress determinants basically constitute the issues that directly result from the introduction and the use of ICTs.

Tarafdar et al. (2007), for example, identified five of them

Technostress creators	Definition
Techno-overload	The fact that users are overwhelmed with a number a technology they cannot manage.
Techno-invasion	The stress that users experience about never being free of technologies.
Techno-complexity	The fact that users fear the increasing complexity of technologies and the necessity of continuous learning and adaptation.
Techno-insecurity	The fact that users fear the impact of updates and changes in technologies.
Techno-uncertainty	The fact that users are afraid that technologies replace them to perform tasks.

Table 9: Technological determinants of technostress (Adapted from Tarafdar et al., 2007)

We find it interesting at this stage to focus on the concept of technology overload or techno-overload and a close theory known under the name of '*the millefeuille theory*' (Kalika, Charki et al. 2007). Although both technology overload *the millefeuille theory* address the difficulties for managers to handle technologies, a slight difference is worth mentioning. Techno-overload defines the increasing number of technologies that knowledge workers are called on to use to perform their tasks. It is basically an issue of the 'quantity' of technologies to master. The millefeuille theory, however, focuses on the extent to which ICTs effectively help knowledge workers to perform tasks advancing that ICTs, set in real work settings are overlayed/stacked and do not replace each other thus leading to a technological overload. Indeed, to perform tasks, knowledge workers are generally called on to use similar technologies that serve the same objective among the stack of technologies they dispose of.

Work environment Determinants of Technostress

A second perspective of studying technostress was through questioning how technology characteristics influence stressors that lead to technostress. The basic claim here is that technostress does not directly result from technology but from factors that are enhanced by technologies. Ayyagari, Grover et al. (2011) examined the characteristics of the technologies which may enhance the imbalance between people and their-environment, resulting in more pronounced and salient stressors. Of the seven proposed stressors, five have been shown to be strongly influenced by ICTs. The following table 8 presents these stressors as referenced in the literature:

Stressor	Definition	Authors
Work overload	The perception that the assigned work exceeds an individual's capability or skill level.	Cooper, Dewe et al. (2001) Moore (2000)
Role ambiguity	The unpredictability of the consequences of one's role performance and the lack of information needed to perform the role.	Cooper, Dewe et al. (2001) Jex and Elacqua (1999)
Job insecurity	The perception of the threat of job loss.	Burke and Cooper (2006) Cooper et al, 2001
Work-home conflict	The perceived conflict between the demands of work and family.	Cooper, Dewe et al. (2001)
Invasion of privacy	The perception that an individual's privacy has been compromised.	Alge (2001)

Table 10: stressors enhanced by ICTs (Adapted from Ayyagari et al., 2011)

Outcomes of Technostress

Tarafdar et al. examined *the impacts* of technostress in two major studies. In 2007, they explored the impact of technostress on the employees' role stress and productivity. Results showed that technostress is inversely related to individual productivity and that role stress which directly related to technostress is inversely related to individual productivity.

In 2010, they investigated the impacts of technostress on the end-user satisfaction with the ITC in use and ICT-mediated task performance which they labeled ITC usage related outcomes or strains opposing psychological and behavioral strains. They also focused attention on the employees' involvement and innovation support as situational variables that reduce the negative effects of technostress creators. In 2011, the impact of technostress on sales professionals' innovation and performance was studied (Tarafdar, Pullins et al. 2011). Moreover, Srivastava, Chandra et al. (2015) proved the negative effect of technostress on job engagement leading even to job burnout.

General findings regarding the outcomes of technostress reveal that individuals experiencing technostress have lower productivity and job satisfaction as well as a decreased commitment to their organization. This joins previous findings arguing that technostress often results in perceived work overload, demoralized and frustrated workers, information fatigue, loss of motivation and dissatisfaction at work, Brod (1984), Weil and Rosen (1997). Other researchers also suggest that professionals experiencing stress from IT usage will demonstrate not only lower organizational commitment, but also turnover intentions and work exhaustion.

Technostress: A State of Continuous Misfit

The concept of fit has been used in organizational behavior studies to investigate the adoption of practices within the organization. Ansari, Fiss et al. (2010), for example, define a fit of diffusing practices as: '*the degree to which the characteristics of a practice are consistent with the (perceived) needs, objectives and structures of adopting organization*' (p.68); the idea being that the adoption of a practice results from a continuous dynamic interaction between the practice and the adopter to reach a fit and that this fit is impacted by technical, cultural and political factors.

In IS studies, researchers who focused interest in the relationships between IT implementation and users' individual performance, used the concept of fit/misfit to assess the extent to which an alignment exits between what the technology offers as capabilities and the tasks that it is designed to help perform. A stream of research on Task-Technology-Fit (TTF) has so far emerged. The fit focus has been mobilized to investigate the impact of a technology on individual decision-making performance (Benbasat, Dexter et al. 1986), (Jarvenpaa 1989), (Goodhue and Thompson 1995). Goodhue (1998), on the other hand, proposed that the

information systems characteristics, features, staff and policies impact the individual performance when they fit the task requirements in the course of the technology use. Similar links have been established between the fit between the technology and the task requirements regarding the adoption of the technology in organizational settings (Cooper and Zmud 1990) and developed measurements of the extent of the fit between the technology and the task requirements (Goodhue, 1998)

More recent IS researchers mobilized the TTF frame to study team management (Maruping and Agarwal 2004), (Fuller and Dennis 2009), systems development and effectiveness (Zigurs and Buckland 1998), and knowledge management systems usage (Lin and Huang 2008) and to add to the acceptation models comprehension (Mathieson and Keil 1998), (Klopping and McKinney 2004).

Markus (2004) also mobilized a misfit perspective to address the issue of organizational technochange. She defined the misfit as '*a misalignment between the technology or a technochange solution and an important dimension of the organizational setting in which it is used*' (Markus, 2004, p. 14). She identified three types of misfits leading to technochange failure: 1) task or business processes misfits, 2) cultural misfits and 3) incentive misfits.

We adopt the same reasoning to assess the process of technostress emergence among knowledge workers. We posit that technostress is the strain triggered by a difficulty and/or failure of reaching a fit between knowledge workers' needs and what ICTs are expected as capabilities. In fact, while ICTs are supposed to meet specific organizational needs of information integration, easier access and share of information, enhancing productivity and efficiency, knowledge workers, the first consumers of ICTs face a different reality characterized by increasing difficulties to manage these technologies and take advantage of their usage in a way that help reach goals and ensure organizational growth. They indeed happen to experience a situation of continuous misfit between what has been expected and what the organizational reality is. The misfits can be caused by several factors that we aim to identify through our data analysis.

3.2.2. Coping and Adaptation to Technostress

An area of study that has recently received interest in the literature is that of understanding how social actors cope with the negative effects related with IT in general and to technostress in particular. The concept of individual adaptation has been conceptualized or understood in different ways in the IS field. We then propose our proper modeling of the specific adaptation process knowledge workers engage in in their response to technostress. Individual adaptation has recently received attention in the IS literature related to IT-induced changes in organizations.

Adaptation as a Coping Process in the IS literature

Basically when individuals experience stressful situations, they engage adaptive efforts seeking the re-establishment of equilibrium between the situation demands and their resources (Lazarus and Folkman 1984). Lazarus, Averill et al. (1974) define coping as: "a problem solving effort made by an individual when the demands of a given situation tax adaptive resources". Thus coping is a process by which people try to manage the perceived discrepancy between the stressful demands they face and the resources they have. In psychological research, Lazarus and Folkman (1984) define coping in their contextual model as '*the cognitive or/and behavioral efforts exerted to manage specific internal and/or external demands that are appraised as taxing the resources of the individual*" (Lazarus and Folkman, 1984, p.141). While internal demands represent the requirements that the individual has and that the environment must meet, external demands refer to the contextual demands that the individual must meet. The cognitive efforts are engaged in order to alter the meaning and the perception of the stressful event. In contrast, the behavioral efforts are situation-focused and aim to change it (Lazarus and Folkman, 1984). Internal demands may take the form of acceptance, denial, declination or escape, while external demands may take the form of activities such as seeking additional information or confronting other individuals.

Adaptive efforts refer to "*aspects of the individual's internal and external environment which are either not directly or completely under the individual's control; they exist in a quiescent state ready to mediate in a positive or negative direction the individuals' response to the advent of a stressor*" (Shapiro 1983).(The stressor engages various types of resources: physical, social, material, psychological, or intellectual. Coping strategies are thus defined as

actions taken in specific situations intended to reduce stress, such as expressing emotions, beginning a new activity, appraising the problem or asking for help. They constitute a response to a specific stressful event and can therefore take a variety of forms.

In the coping approaches of adaptation, a fundamental assumption is that coping is an organized activity and that 'adaptation strategies' are elaborated to face a disruptive *event*. Coping strategies are indeed actions taken in specific situations that are intended to reduce stress, such as expressing emotions, beginning a new activity, appraising the problem or asking for help. Also, IS researchers put forward various forms of coping through various conceptualizations of the adaptive action. For example, behaviors other than acceptation and usage such as appropriation of structures (Poole, Homes et al. 1988, DeSanctis and Poole 1994), reinvention of processes (Rice and Rogers 1980), mutual adaptation of users and organizations (Leonard-Barton 1988), and adjustments to technological change (Majchrzak and Cotton 1988) have been shown constituting adaptive acts.

According to Beaudry and Pinsonneault (Beaudry & Pinsonneault, 2005), there exist two prominent but contradictory approaches to the study of adaptation in the IS field: *the variance approach and the process approach*. The variance approach focuses on the establishment of the causality relationship between the antecedents of technology usage and the user adaptation. In contrast, the process approach focuses on developing an explanation of the causality relationship between the user adaptation and its outcomes. Studies adopting *the variance approach* have been primarily quantitative. Scholars have proposed models to examine characteristics, both technological and individual, that lead to IT usage/adaptation. However, studies utilizing *the process approach* are more qualitative and interpretive. Scholars focus on how users experience IT-induced changes by examining the user adaptation process (Tyre and Orlikowski 1994, Orlikowski 1996). These scholars claim that adaptation can be explained through behaviors other than simply usage.

Because they consider articulating those approaches can improve our understanding of adaptation, some researchers called for an integration of both perspectives because they are complementary (Newman and Robey 1992), (Robey 1996). In particular, Beaudry and Pinsonneault (2005) answered that call of integration by proposing an interesting application of the coping theory in the IS field: the Coping Model of User Adaptation (CMUA). They not only proposed a definition of the adaptation as *the cognitive and behavioral efforts performed by users to cope with significant information technology events that occur in their work*

environment" (Beaudry and Pinsonnault, 2005) but also went in depth in the concept of 'adaptation' by examining the adaptive actions that users engage towards new and disruptive technology "events". They distinguish four adaptation strategies based on a combination of the perceived consequences of the situation, opportunity or threat, and the level of control people have over the situation, high or low. The four proposed different strategies are: 'Self-preservation Strategy', 'Disturbance Handling', 'Maximizing Benefits' and 'Benefits Satisfying'.

Adaptive Response to Technostress: adaptation to 'an event' Vs. adaptation to 'a state'

The approach of Beaudry and Pinsonnault (2005) is interesting in that it helps understanding how the individual copes with punctual, disruptive and stressful IT "events". In contrast with those punctual events, technostress is a continuous condition. A more dynamic process of adaptation is thus necessary for understanding how knowledge workers cope with technostress. However, we propose a different approach from that of Beaudry and Pinsonnault (2005) by investigating the *continuous* process of adaptation to technostress rather than the punctual adaptation to stressful IT *events*.

Influences on the adaptive response to technostress

> *"It is argued that individuals form beliefs about their use of information technologies within a broad milieu of influences emanating from the individual, institutional, and social contexts in which they interact with IT"* (Lewis et al., 2003, p.657)

We aim at investigating to what extent the dynamic process of adaptation to states of technostress is a function of institutional, social and individual factors that filter the adaptive response of knowledge workers through their influence on individual perceptions. To this end, we adopt the literature about the individual's construction of cognitions and beliefs about technologies. Indeed, the constructs of 'cognition' and 'beliefs' are widely used in the IS literature to assess the determinants of individual perceptions about technology acceptance and use (Lewis, Agarwal et al. 2003). We adopt the same reasoning and propose that the process of adaptation to technostress at least partly results from the perceptions and beliefs that knowledge workers develop about technostress. By exploring the elements that influence knowledge workers' beliefs and perceptions about technostress, we expect to gain greaterunderstanding about the adaptation process they engage in so as to resolve it. A research note by Lewis, Agarwal et al. (2003) reviewed the various sources of influence that

shape the individuals' mental models about technology. They categorized them into three types: institutional factors, social factors, and individual factors.

Institutional Dimension

Research within institutional theory focused on the influence of organizational culture, norms, values and history on the shaping of individuals' attitudes (Scott 1995). The IS literature has been as well interested in studying the influence of the institutional context on individuals' behaviors of use and acceptance of technologies. Indeed, since Robey's works (1979) claiming the necessity of considering organizational factors in examining behaviors towards technology. Researchers investigated various institutional factors such as knowledge management (Boynton, Zmud et al. 1994) or organizational support (Leonard-Barton and Deschamps 1988), (Monge, Cozzens et al. 1992). Moreover, organization attributes such as power relationships and politics in the work place have been studied essentially in contexts of IT implementation (Markus 1983), (Levine and Rossmoore 1994) with an essential claim: behavior is not system-determined or individual-determined but results from an interaction of both. Markus (1983), for example, explained the phenomenon of resistance to new IT by the interplay between the system and the individual on the one hand, what she called the socio-technical dimension; and by the interaction between the system features and the distribution of power in the organization (either institutionalized or symbolic), labeled the political dimension on the other hand.

Social Dimension

The IS literature recognized the importance of the social dimension in influencing the shaping of individuals' perceptions about technologies. Factors borrowed from social psychology ranged from social norm, especially used in behavioral models such as the Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB) (Taylor and Todd 1995, Taylor and Todd 1995), (Thompson, Higgins et al. 1991) to more IS focused factors drawn upon social information processing theory (Schmitz and Fulk 1991, Fulk 1993) such as individuals' social networks.

More recent studies explored the role of externalities in determining the individual acceptance and usage of IT. They focused on technological acceptance either by trying to extend the

theoretical conceptualization of this concept through introducing new elements from the evolutionary psychology (Abraham, Boudreau et al. 2013) or by studying how a network's externalities influence the technology acceptance and use (Strader, Ramaswami et al. 2007).

For example, Wattal, Racherla et al. (2010) studied how technology usage was influenced by positive feedback from others and how a network's effects on technology are moderated by demographic variables. Bruque, Moyano et al. (2008) focused on the effects of social networks on individual adaptation to IT-induced change through the examination of two types of networks (informational and supportive) as socio-psychological factors. Magni, Angst et al. (2012), studied the effects of team network structure on information technology use. More precisely, they examined how the structure of a team's advice-seeking network affects individual use of a newly implemented information technology. Another study by Maruping and Magni (2012) identified team learning climate and team empowerment climate as key factors that affect an employee's propensity to explore new system features. Furthermore, Dickinger, Arami et al. (2008), developed the role of perceived enjoyment and social norms in the adoption of technology with network externalities based on people's tendency to rely heavily on peer-to-peer interaction influencing the adoption of new media formats that enhance this interactivity. They concluded that perceived enjoyment and social norms are important antecedents for the adoption of technology with network externalities.

Among the externalities that have been studied by researchers, we identify types of mediators of ICTs adoption and use. For example, team related externalities such as the team structure (Magni, Angst, and Agarwal (2012), and the team learning climate (Maruping and Magni (2012) can be considered as work environement factors. Social norms and peer-to-peer interaction (Dickinger, Arami et al. (2008) or positive feedback from others (Wattal, Racherla et al. (2010) appear to be social externalities.

Individual Dimension

According to Lewis et al. (2003), individual aspects are the most proximate and most relevant aspects to build individual perceptions about ICTs in organizations.

Drawing on such an argument , we propose that knowledge workers engage adaptive actions towards the state of technostress with a consideration of individual factors. We posit that two constructs are of paramount importance in the specific setting of this study: (1) categorization, which perceptually accentuates differences between in-group and out-group, and similarities

among in-group members (including self) on stereotypical dimensions and (2) self-enhancement which seeks behaviorally and perceptually to favor the in-group over the out-group.

Self-enhancement defined by Pfeffer and Fong (2005) as '*the desire or observed reality of seeing oneself and by extension one's actions, traits and attitudes in the most positive light*'. Self-enhancing implies that people willingly accept and continue to live anomalous situations for a multitude of reasons. As Pfeffer and Fong stated, commitment escalation could be a reason because when people deliberately choose a work situation, they tend to continue on the same course of action even when the situation become unpleasant through the rationalization of the situation as not bad. Another reason would be the comparison between the situation in which the workers live and other situations outside the organization (in the job market) resulting in assessing that they have no choice because the situation is similar to or even worse outside. But one reason that received much interest is the will of people to be part of the 'Winners' and be associated to success. Hence, they are willing to '*subjugate their interests and their emotions at least for some time and to a certain degree*' (Pfeffer and Fong, 2005). Self-enhancement as an adaptive strategy has been related to the degree of power and influence that the individual has. Indeed, insights from socio-psychologists posit that individual perceptions are built through the interplay of individual and social dimensions. They as well recall the concept of 'Social Actor' introduced by Lamb and Kling (2003) where they extend the '*socially thin construct of user*' by studying how the relationships that an individual develops with his context are not only important but are also shaped though the connection of the individual to a multitude of contexts.

3.3. Methodology:

The purpose of the research is to explore the process through which knowledge workers' adaptive response to technostress emerges and develops over time. The nature of the research question (exploratory) and the objective (understanding a process) requires an in-depth qualitative research methodology. The research methodology followed in the present thesis is that of grounded theory (Glaser and Strauss 1967, Corbin and Strauss 1990), (Charmaz 2006) aiming at generating an exploratory theory of the adaptation of knowledge workers to technostress.

In doing so, we answered three points that grounded theory methodology raises: the inductivity, the contextualization and the processual view. First, we adopted the inductive nature of the grounded theory methods because it allowed us to explore a novel topic where, to our knowledge, no theory is established which seemed useful to explore the process of the emergence of adaptive responses to technostress among knowledge workers. Second, we focused attention on the context in which data were collected. In fact, dealing with how knowledge workers engage adaptive acts towards technostress lies in a deep understanding of the organizational settings in which they perform their tasks. Third, as Glaser and Strauss (1967) suggested that 'grounded theory facilitates "the generation of theories of process, sequence, and change pertaining to organizations, positions, and social interaction"; we judged appropriate to follow this research methodology in drawing that process.

3.3.1. Sample Selection:

The study described herein was undertaken in the context of Paris-Dauphine University (Paris, France) where we approached MBA students. The Sample comprises 22 managers from different corporations (Insurance companies, public services, software editors…) who heavily rely on ICTs in performing their daily tasks. First, we approached the class of MBA via the e-mailing list of the MBA department, explained the topic of our research and our intention to conduct interviews. We contacted the class members who positively answered to arrange dates and hours of interviews. From the 22 interviews, 20 were good to exploit.

We expose in the following **table 9** the list of participants with respective demographic data.(the table below is numbered **11**, have a look, please)

Name	Participants' Demographic Data
Frank	Sales Director, Information Technology and Services, Male, Age 50 years, 4 years in job, 15 years in industry.
Marco	Senior Intelligence Analyst, Rail Road Manufacture, Male, Age 30 years, 4 years in job, 6 years in industry.
Yohann	Branch Manager, Health Service in Food Industry, Male, Age 37 years, 5 years in job, 10 years in industry.

Michael	Head of IT, Insurance & financial services, Male, Age 52 years, 4 years in job, 15 years in industry.
Olivier	Head of OTC Operations, derivatives and stock lending, Investment banking, Male, Age 37, 6 years in job, 10 years un industry.
Raef	Business Analyst in operations and finance, Computer Software and consulting, Male, Age 34 years, 3 years in job, 8 years in industry.
Zakaria	Responsible of studies and research, Transportation and Tracking industry, Male, 36 years, 7 years in job, 10 years in industry.
Halima	Market manager, Insurance services, Female, Age 40 years, 4 years in job, 15 years in industry.
Ander	Engineer, Construction, Male, Age 38 years, 7 years in job, 12 years in industry.
Caroline	Management and Information Systems consultant, Management consulting, Female, Age 29 years, 5 years in job, 6 years in industry.
Dennis	Technical Director of Services, Industrial engineering, Male, Age 55 years, 10 years in job, 20 years in industry.
Kaoutar	AMOA and Business Intelligence Consultant, Management Consulting, Female, Age 35 years, 4 years in job, 5 years in industry.
Marine	Project manager, transportation and Tracking Industry, Female, Age 39 years, 3 years in job, 7 years in industry.
Marion	Senior Consultant, Management Consulting, Female, Age 29 years, 4 years in job, 5 years in industry.
Philippe	CRM Solutions Consultant, information technology and Services, Male, Age 31 years, 4 years in job, 5 years in industry.
Laurent	Head of Management Control, Newspaper industry, Male, Age 57 years, 2 years in job, 5 years in industry.
Catherine	Head of Compliance and Ethics, Consumer Goods, Female, Age 49 years, 7 years in job, 10 years in industry.
Walid	Key Account Manager, Tourism and Travel Industry, Male, Age 35 years, 6 years in job, 9 years in industry.
Anne	Program Manager Officer, Management Consulting, Female, Age 39 years, 7 years in job, 11 years in industry.
Sylvie	Head of social collaboration and Knowledge Sharing, Management

Consulting, Female, Age 50 years, 5 years in post, 15 years in industry.

Table 11: Demographic data of participants

3.3.2. Data Sources and Collection:

As we followed a grounded approach entailing the use of semi-structured interviews, we focused on understanding how the knowledge workers assess their stressful working environment through exploring what, to their view, triggers feelings of technostress and what factors they consider when in their response to it. Interviews lasted in average 1 hour and were conducted in both participants' work offices and elsewhere. Interviews were type recorded with the agreement of participants.

Data collection focused on two major topics. First, participants were asked what stressed them most in their daily work in relation with the technologies they use to perform tasks. Questions ranged from direct ones (How many technologies do you use in you work?; What is the first thing you do once you wake up/ are in the office?); to more reflection-needed type of questions (What makes you behave this or that way?). Second, we focused on how participants act towards technostress by asking them questions such as: How do you manage very busy/stressful days? / Do you have any tactics/strategies of work management?

First interviews were more open-ended than later ones because we proceeded to the transcription, the coding and the analysis of data very shortly after conducting the interviews which allowed us to make first themes and categories emerge.

3.3.3. Data Analysis

> *'Coding means categorizing segments of data with a short name that simultaneously summarizes and accounts for each piece of data'.* (Charmaz, 2006, p.43)

After transcribing all the interviews, we began by '*initial coding*' to make sense of our data by both staying close to the data but open to explore what it suggests.

We firstly named segments grounded in the data which we categorized in codes that constituted the initial basis of our analytical work. This categorization was not built upon predefined codes but emergent, cumulative and data driven ones.

We then proceeded to '*focused coding*' in order to develop categories and concepts. Known also as 'Axial coding', we followed the principle of constant comparison (Glaser and Strauss, 1967, p.106), and we systematically compared the content of each coded interview to new ones to assess if a new category has emerged and needs to be addressed on its own which has led to the revision of established categories. The revision included merging two categories into one, removing categories, splitting one category into two or more or relabeling categories. In parallel, we undertook the writing of our first theoretical memos about the categories and their relationships.

The last step of analysis consisted in engaging '*theoretical coding*'; we were able to transform categories from very close data to more conceptual data. This was carried out through broader reading of data to conclude with fundamental regularities that constituted the ground of our theoretical frame.

The process we undertook implied that interviews which were conducted late after the previous ones were transcribed and analyzed (in part). The list of interviews was set but the interviews were conducted within a time window that allows the transcription and analysis of the previous interviews as Glaser and Strauss recommend (Glaser and Strauss, 1967). Our sampling was thus theoretical and not predetermined neither was it randomly taken. As the list of participants was selected in early stages, the interview guide evolved in a way that answers the needed information.

The following table 12 shows one example of the process we undertook to analyze our data and the different levels of coding.

Concepts	Categories/ themes	Initial Codes	Examples
Privacy invasion	Private and professional life boundaries, Continuous connexion	Have to be reachable, overwhelmed, no time,	I work as a team manager within a 24 hour- service. I need to be reachable all time. I wake up at 5 in the morning...if there are no emails, I am like...something is certainly going wrong. how comeI didn't receive emails…while I should definitely tell myself it is the opposite.
			My alarm clock is my professional phone; I shut it down and directly check my inbox. I am exhausted but I check my inbox, who has sent what, I don't read the content but see who sent it and the subject. I feel overwhelmed…
			There is no longer a separation between private and professional life. We confuse both and respond to all…
Information overload	Too much information	Mountains/ piles of information, overwhelmed, a lot of stress, hard to manage,	It is huge… huge the quantity of information we have to treat every day. Mountains of information, data, reports, figures…
			You feel like you'll never be able to treat all that. If I try to treat all, at the end of the day, I feel like I worked a lot but didn't do anything significant.
			We really feel overwhelmed … we spend long days from 9 a .m to 10 p.m.. it is a lot of stress. The most difficult thing is , I think to manage the multi-tasking
Work overload	Work load / work hours	Long hours, until very late,	I worked until 2 in the morning every day. I stay in the office until 10 p.m and then go home and begin again at 11 p.m You don't have time for anything else.
			I worked in a 24 hour- service.
IT overload	IT Problems / too many technologies		I have hit my screen with my phone many times because it irritates me, I don't understand how it works!
			When you click and don't get the result you expect , it is really frustrating!!!
			Computers are their enemies...they get irritated when using SAP or other software.. .There are always people to struggle with computers… let alone if it does not work as they want to.
Email Overload			Oh Emails…it is too much
			Not necessarily useful ones

	Quantity Easiness Costless	Infernal, too much, excess,	The issue of the cc… who needs it?
			It's infernal…people try to reach you at all costs.
			The problem is that only 60% of emails are interesting… I believe it is the facility to do it that makes people send t many emails. It is not paper and it does not take much place, we tend to send and over use the cc even for a thank you or a yes.
			We are so in a context of maximum reactivity we feel obliged to check our inboxes. Sometimes these emails are so stupid, questions that they ask again and again…
			It is hard to set rules to decrease the usage of emails…
	Interruption	Hard to concentrate, waste of time, non-planned, disrupted activity…	It is true that each time you need time to reconcentrate on your initial task. It is a time loss from 2 to 5 minutes…of course you check other websites, your private inbox, begin a discussion with a colleague before going back to the initial task.
			It is getting harder to cut yourself of the whole thing to concentrate…
			That's why we go back to the initial issue... what is a manager today? He has to handle multitasking, have the capability to do many things at one time, aggregate many sources of information, to reconcentrate after interruptions… it is not easy at all to manage an interrupted, non-planned and constantly disturbed activity.
	Handling emergencies	Emergencies, constraints, last minute calls	Everything is half done...Answers are never well thought out… you need an additional treatment.
			Especially with emails, we work in total emergency. you are constantly asked to do something other than what you have in hands
			I have my work, my meetings, my emails, my appointments and all my software… I used to be able to concentrate on just one task… now there is always something that interrupts you.
			Your day planning is disturbed in 80% of cases because you have last minute calls and requests… it is a recurrent thing
			Now I set appointments between 10 and 12 a.m. I know I will be disturbed after that with emails and other requests.

	Constant fear of missing information		Somehow you are never disconnected from your work environment… Technically you can but you will keep thinking you're missing something important.
			I stay connected during weekends to handle emergencies
			When you receive something important, you can't get it out of your head… you have to answer. It is the only way to get it out of your head.

Table 12: Initial, focused and theoretical coding (Example)

3.4. Results:

We structure our analysis as follows: In the first part of our analysis, we examine how individuals experience feelings of technostress by focusing on identifying the misfits that trigger technostress states among knowledge workers. The second part of our analysis focuses on the various transactions frames that influence the shaping of knowledge workers' adaptive responses by exposing our findings about the set of transactions that constitute the adaptation to technostress.

3.4.1. Technostress among Knowledge Workers

We first address the technology-related misfits that trigger technostress among knowledge workers: technological overload, information overload, ubiquity, repetitive disruptions and continuous sense of urgency.

Data suggested that individuals are aware of the importance of using IT in their work. The information they need to perform their tasks is obviously easier to access because the technological means that they hold facilitates information searching. Moreover, participants recognized the importance of information search and use in their work.

> *"I think it is an exceptional luxury and convenience, the fact that you are able to consult and search for information everywhere and at any given time."*

> *"I consider myself fortunate (to have IT resources available) because otherwise, manually, I have no idea how anyone could make progress."*

Information Overload

However, the informants expressed experiencing feelings of *information overload* which triggers feelings of stress. In fact, as the technological tools help knowledge workers easily search for and access information, their common attitude is to be open and pay attention to every single information they receive. In fact, the multiplicity and variety of sources of information result in knowledge workers drowning under information coming from both internal (reports, communication within the organization) and external environment. Not only can the multiplicity of information sources cause information overload but also the inconsistency of the quality of information. While some sources are reliable (which would be the case of information sources within the organization), knowledge workers still use external sources and are thus called on to proceed to verification and control in order to guarantee the reliability of information they use to perform tasks.

Another challenge that knowledge workers face is the fact that information and data are very different regarding the format. They are called on to use raw data such as figures and more aggregated information they find in reports which requires to continuously adapt their sense of analysis and interpretation capabilities.

What really triggers stress, participants assess, is the feeling of being overwhelmed and unable to manage all the information they have. Additionally, they regret that if they are unable to manage the whole quantity of information, they would miss some important one that would help them perform their task with more efficiency.

> *"Yes it is too much; it is unbelievable. We process mountains of information every day. We have mountains of figures and reports that we deal with.*
>
> *"Nowadays, we have really many sources of information and no control over these sources. On your side, there is a need to control the quality of this information, by controlling the quality of sources. Since there are many channels for diffusing information, the synthesis/analysis capacity/ability is crucial."*

Technological Overload

In addition to being representative of the *technological overload* that knowledge workers face, the following quote exhibits the layers of technology that they are expected to contend with. The interviewees claimed that they use many technologies to process information when performing their tasks. Called to master many software, knowledge workers feel the

obligation and urge of handling the entire range of technologies. Although the initial objective behind using ICTs in organizations is to enable workers perform their tasks in a more effective and efficient way, knowledge workers witness the reality of increasing difficulties in simultaneously handling the technologies in use which imbalances the situation. More specifically, knowledge workers face difficulties with the replication of technologies because they are called to use two or more different technologies that offer the same yet interchangeable features but still in need to use all of them. Also, continuous updates and the incompatibility between different technologies in use bring about frustration among knowledge workers because they waste time and effort in handling these difficulties instead of devoting time to performing their tasks. The quantity of technologies in use is thus:

> *"We have many/a hand full of those; you have to find the time in order to be able to make use of it and to put information into it. I have 5 or 6 kinds of software at my disposal that I am /expected to use all the time."*

Another trigger of stress is the feeling of constant connection due to the *ubiquity of ITCs*. Participants noted that ICTs are so present in their professional and private life that they hardly conceive their life without them. ICTs constitute a crucial part of their life. They feel they are anymore free of technologies in both their work environment and private sphere.

> *"When I look into the future, I can't envision myself removed from my cellphone, my emails. When it comes down to it, you have to know how to manage it all so that it does not irritate you too much."*

Furthermore, the boundaries between professional and personal life are getting more and more blurred. Knowledge workers use ICTs in their private life as well. For a major proportion of them, the same device is used to receive professional and private messages resulting in a lack of clear frames generating sensations of loss between these two spheres of life which may trigger stress.

> *"One cannot separate professional and personal life. We mix everything, we all always available and everything is a mess"*

The combination of these factors results in the fact that knowledge workers are continuously exposed to technostress, a prevalent fact that participants assessed when describing their behaviors as big consumers of ICTS.

"…it is exhausting; you are asked to do too much. It is stressful actually. You have developed this new reflex to check your emails all the time. Look here, I am drinking a coffee with you and I am checking on my phone every now and then!, It is stressful but useful.

Actually I live with my phone. It is sad but true. A week ago, someone tried to steal it from me and I thought, what would I do without it? It turns into an additional activity and you become frantic, verifying your things so often. But it makes my life easier. The faster it goes, the more you pay attention. It is like driving a car. If you are driving at 30km/h you are relaxed; if you are driving at 120km/h, you are necessarily more vigilant, which brings stress. In regard to technology, we are driving at 120km/h, which still has advantages though.

Email Overload

Participants also raised that the use of a specific technology: Emails triggers various sensations of technostress. Participants admit that they tend to continuously keep an eye on their email tools while performing other tasks. In fact, this technology constitutes a fundamental source of a large amount of information for knowledge workers. Because such technologies are easy to exchange and are not costly participants admit that the email is the technology they use most (sending, receiving, managing…) resulting in very high averages of exchanged emails per day. According to our interviewees, the origin of the problem resides in the flexibility and continuous access to emails that mobile devices offer for their users which enables them to send and receive messages in an asynchronous and ubiquitous way. Thus, places that are originally reserved to work are invaded by communication technologies in a similar fashion as emails and boundaries between work and private spaces are blurred due to the fact that knowledge workers tend to show high levels of reactivity and be on an endless standby. Also, the content of emails is very different which implies adaptable levels of focus and integration of information to process.

In conclusion, knowledge workers assess that the advantage that they could take from the high computerized environment they are working in is turning out to negatively impact both their productivity in devoting increasing time to manage emails; and their well-being stated in their continuous exposure to stress stemmed from the overload of email.

"I used to work in a 24/24 service/facility and I was a team leader/manager, therefore I had to be reachable constantly. I used to wake up at 5 a.m.; if there were no emails, there had to be some problems. (I would think…) Why haven't I received anything, although I should be thinking the opposite."

"My alarm clock is my work phone. I switch off the clock alarm and check my email. I am exhausted but I look at who has sent me something. I don't read it; I just look at the sender and the subject. I would feel overwhelmed and I lived for it. I used to work until 10 p.m. every day, and I would continue from 11 p.m. to 2 a.m. at home. You don't have time for anything else."

Interruptions

Second, email interrupts concentration; workers need time to read and manage emails. They also need time to re-concentrate on the task at hand after checking email. This work assignment seems to be impaired and knowledge workers don't often immediately go back to perform the previous task.

"It is true that there is always time in order to tackle the initial task. There are 2 to 5 minutes that are lost, spent checking your email inbox, looking for information on the net, starting a conversation with a colleague, before you get back to the initial task.

Finally, the use of emails often creates new needs to perform unplanned tasks which requires extra time to handle emergencies to compensate for the program's inadequacies.

"The email inbox is always open and I have a pop-up window that tells me that I have received a new one. It's true, you feel an urge to go and open it. That is what we do most of the time. It becomes more difficult to isolate yourself and to concentrate. That is why it comes down to the same thing; a manager nowadays has to handle multitasking, be able to do many things at one time/ at once, to join many information sources, to be able to refocus after interruptions, and it is not easy to handle the disconnected, unplanned, that is constantly influenced by external factors."

Constant connectivity / Sense of urgency

Using email and other communication technologies can also result in a feeling of permanent stress as individuals constantly fear missing information or being left behind. They therefore prefer to receive too much information rather than missing it.

Our interviewees admit as well-being captive of their work environment because they feel the urge to be continuously reachable and willing to work anytime and anywhere.

Actually nowadays, workers are expected to demonstrate a high level of reactivity and productivity that ICTs are supposed to help them reach. However, they happen to be overwhelmed by the new IT-induced requirements implying longer hours of work, and a non-

stop connection with work via communication technologies during late evenings, on weekends and even on holidays.

> *"A part of you is never completely disconnected from your work environment. Yes you could, but you will always have the feeling something is missing, especially the emails. We are always working in a hurry; you are permanently asked to give important information."*

> *"I stay connected during the weekend in order to stay reachable and be able to manage urgent tasks/requests and every possible problem, and see whether I missed something in the evening. When it is switched off, the deal is done and we don't worry. When it is on and you receive an important piece of information, it haunts your mind and you can't get rid of it until you answer. I answer; I can't switch (my mind…) off and the vicious circle restarts. We always have this anxiety that we are going to miss an important piece of information when we should have answered."*

> *"Yes I prefer this, having all possible information and losing time rather than missing a piece of information."*

The closer we looked, at the rapid pace of work, the more we realized that it has as well been assessed by interviewees as an added factor generating technostress. Nowadays' knowledge workers are entitled to perform a substantial number of tasks within the traditional time frame And to continuously adapt their planning to unforeseen events while managing unexpected emergencies.

As Frank, a sales manager in a multinational company affirms:

> *"We always are in a rush with work; everything is completely hurried. You are always asked to provide an important piece of information; you are always taking on external tasks that you hadn't planned for. If you plan your work day, and if you tell yourself I will do this and that and not that, you know in advance that you will be interrupted and asked to take on tasks, other than what you have planned. When it comes down to it, this is the daily routine of a manager; you have to do what you have planned and deal with what comes up unexpectedly."*

After assessing the triggers of technostress feelings among knowledge workers, we proceeded to the classification of such triggers. Two types actually emerged: technology-related triggers and work environment-related triggers. The technology-related factors involve techno-overload and information overload while the work environment related factors refer to interruptions, constant connectivity, and sense of urgency.

In the following table 13, we summarize our findings regarding the triggers of misfits which entail technostress. For each misfit, we expose the expected outcomes of ICTs adoption/usage in organizational settings versus the reality that knowledge workers happen to come across. .

	Expected Outcomes	Reality	Resulting Misfit
1	ICTs are expected to enable more effective management of information, easier access to data and better exploitation because they offer efficient techniques of storage	Knowledge workers are overwhelmed with information because they are exposed to a multitude of sources of information both internal and external to the work context.	**Information Overload**
2	ICTs are expected to facilitate performing tasks. each specific technology is meant and assigned for users to take advantage of.	Knowledge workers are called to simultaneously ensure many and different tasks. To perform them they rely on different technologies which they perceive as over present.	**Technology Overload**
3	Emails are supposed to facilitate communication between individuals as they offer greater flexibility and control over communication tasks. They enable constant information share and exchange and continuous access to data.	Knowledge workers heavily rely on emails as the central means of communication within and outside the organization. Given the facility of sending and receiving emails, knowledge workers tend to over use emails for business and non-professional purposes. They thus reach very high averages of emails exchange/sharing. Still challenging is the necessity of managing received emails (replying, classifying, forwarding...) which costs energy and time without a real added value.	**Email Overload**
4		Fearing the risk of missing some information that would be beneficial to perform their tasks, Knowledge workers, keep constant connection to their emails. Boundaries between work space and/or time and private space and/or time are blurred.	**Interruptions**
5		The constant connectivity results in repetitive interruptions of task performance among knowledge workers because they generally opt for active notifications when they receive a message. Willing to show high reactivity, received messages are instantly checked while working on another task. Not only can emails cause interruptions, phones and instant messaging are as well sources of interruptions.	**Constant connectivity** **Sense of constant urgency**

Table 13: Misfits triggers of technostress (Expected Vs Reality)

Figure 1 further explains our findings.

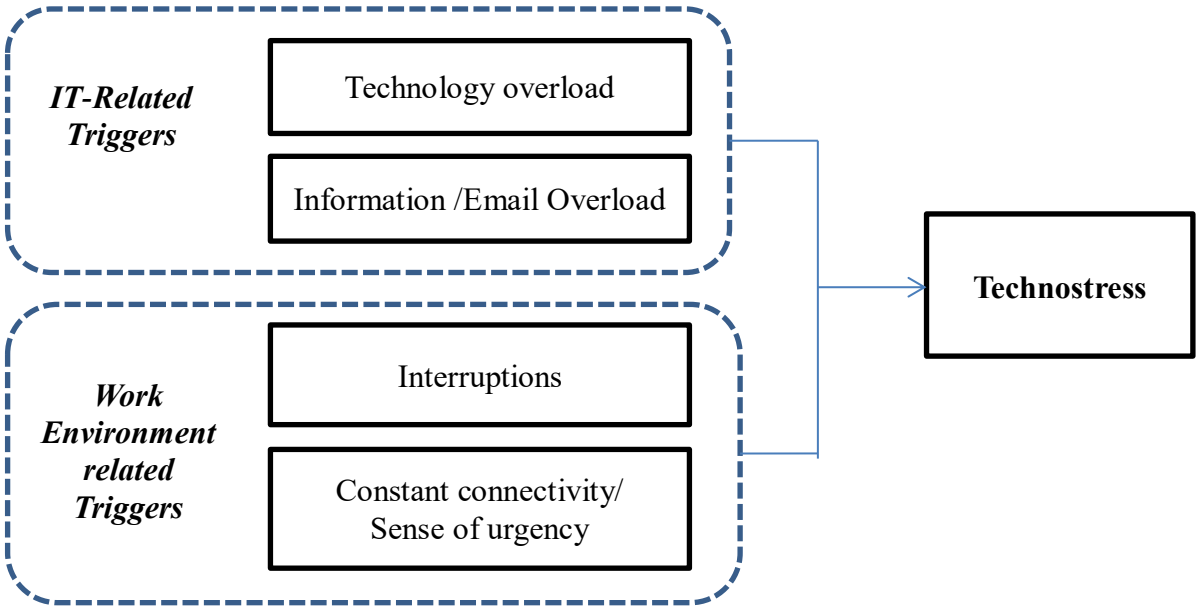


Figure 1: Misfits triggers of technostress

3.4.2. Adaptation

Data revealed that the adaptation process that knowledge workers engage towards the continuous state of technostress is constituted by a set of transactions that take place within certain transaction frames. Coping strategies of knowledge workers towards technostress are shaped through these transactions.

For that, we propose a typology of the transactions frames constituting three types: 1) an institutional transaction frame; 2) a social transaction frame, and 3) an individual frame of transactions.

Institutional Transaction Frame:

The first type of transactions of knowledge workers' adaptive responses refers to: institutional transactions which involve 1) Power and political factors, including themselves; 1.1) Knowledge workers' hierarchical position and 1.2) Information power and 2) Knowledge workers' perception and interpretation of their organization technological strategy.

Power/Political Transactions

Hierarchical Position:

Participants revealed that the adaptive acts they engage in depend on their hierarchical position. Perceptions of the influence of hierarchical position consisted in considering that knowledge workers of higher hierarchical levels would experience more challenging context of work whereby they are continuously called to adapt to obligations of constant connectivity and reactivity given their role as decision makers. Participants from lower hierarchical positions admit feeling less pressure regarding constant connection and reactivity because they hold less management responsibilities and are by no means required to handle emergencies. This means that knowledge workers of high hierarchical positions would be more exposed to the work-environment-related triggers of technostress notably the sense of urgency and constant connectivity. For that, knowledge workers, when opting for a specific adaptation strategy to states of technostress, take into account the obligations and the expectations their hierarchical position implies.

> *"Actually, the more we scale the hierarchical pyramid, the more difficult it becomes to disconnect. There are managers who, even during vacation, still send emails and take part at work. You ask them a question while they are in vacations and you receive an answer within 24 hours. Some people don't see these limits."*

> *"First, I don't have major managing tasks to have to stay connected all the time. I think the responsibility of each and every one must be taken into consideration. When you ask your project manager to be reachable, it is the same for a boss/supervisor."*

Information Power:

An additional factor that knowledge worker pay attention to when setting their adaptation strategy is the power that information offers to some individuals over others. In fact, ICTs, though offering both easier and more rapid access to information and more effective management of data, they are thought to be limiting the capacity of individuals who hold a distinguishable expertise that they developed over time and is hard to replicate by their peers because technologies somehow 'democratize' information. Indeed, participants revealed that

new ICTs, in enabling the access to information to everyone, would deprive some workers from the value they used to generate from information they alone had access to.

Although exposed to information overload which trigger states of technostress, knowledge workers tend to behave in a way that protects them from losing any power based on their expertise and information. These considerations would influence the way knowledge workers engage an adaptive response. We can thus imagine situations where knowledge workers who, seeking to keep the expertise, they have, would be willing to experience higher levels of technostress.

> *"Actually, technologies democratize somehow the value of information. I have spent years in order to understand that, that information is valuable from these people. After they have given you the information, do not believe it is right/the right one/what you need."*

Frank, a sales manager in a multi-national company, affirms that the 'information withholding is a common behavior in the company where he works and to which he is accountable. He refers to what he calls: 'Zone of Certainty' where people feel comfortable about holding information or an expertise. Once they are threatened by other people willing to cross this zone, they respond by retaining the information.

> *"Oh yes, absolutely! I call this certainty zones. From the moment when they control a tool, a skull, a know-how, they want absolutely to keep even a small part of the power related to this control. New information technologies enable that. The management accountant is some-how owner of his way of doing things. When I need information and I use the system that he only controls or masters, I get aware that he defends his of control by avoiding sharing all."*

> *"Withholding the information is a very classic game in the organization and even worse with the technologies. For someone who has work for the company for 30 years, simply has all the information that he feels threatened to loose with the technologies as he no longer has the monopole of the information. They feel they lose in power. Actually, technologies democratize somehow the value of information. I have spent years in order to understand that, that information is valuable from these people. After they have given you the information, do not believe it is right/the right one/what you need."*

The perception of the organization's technological strategy

It basically refers to how individuals make sense of the expectations of their organizations through the use of technology. Our data showed that knowledge workers have similar ideas about how their type of work should be accomplished. The status of 'knowledge worker' which they hold implies a specific attitude and certain patterns of behaviors.

The data also reveal similarities among organizational expectations for knowledge workers. Our study's participants consider that being continuously connected and therefore continuously reactive to their work consists a new, inherent aspect of the organizations' expectations from knowledge workers who rely on ICTs to perform tasks. The intensity of work environment related triggers of technostress notably the sense of urgency and the expected constant connection to work actually press on knowledge workers because they dispose of all technological means enabling them to perform further extra tasks in a more effective way.

> *"The first goal behind it is not to be blocked when we are outside, and so that we don't stay dependent on a landline. They hand us the USB 3G key and similar solutions so that we are able to communicate. At the beginning, it is good and helpful, but it progressively becomes complicated as we communicate now more than ever. They say they provide us with the technological solutions to make work and communication easier. They require a certain level and expect us to be always reachable."*

> *"We prefer this kind of people now; we don't have a choice anyway. Technology is now everywhere"*

> *"They estimate that managers are senior and well paid enough to be able to handle the overload problems and the overabundance of information systems"*

> *"This logic is based on comfort zones. Marion, she is still in her comfort zone; she can still do things, and I will bombard her with work until she is saturated. The objective is to always stay overloaded and to always have something to do.*

The perception that knowledge workers hold about their Management expectations and the interpretations they make of it, heavily filter their adaptive response to technostress. Cases can differ from organizations that set high expectations and greater objectives to their workers to organizations where there is less pressure on workers. Also, differences between organizations reside in the extent to which they rely on ICTs to perform work and how much investment and return on investment they require.

Adaptation strategies that knowledge workers would engage would differ from one case to another as the institutional dimension heavily weighs on the decision of how to cope.

Social Transaction Frame

The second type of the transactions that shape knowledge workers' adaptive response refers to social transactions. It includes 1) the team climate and 2) peers' behavior.

Team climate:

Knowledge workers experience situations where they feel obliged to comply with the group climate. In fact, they focus attention on their peers' attitude and behavior and build perceptions about how to behave on that basis. Regarding dealing with technologies, they focus attention on how the group they belong to is generally behaving and align their behavior to it.

> *"When we ask a user for their opinion regarding the new tool, they always answer, it is going very well, no one would tell the truth.*

Knowledge workers experience a constant need to prove they deserve the position they hold within the organization, in that showing control over the situation to convey a positive image of themselves which an implicit or explicit competition between peers that would characterize the team climate.

The team climate can as well be characterized by a climate of mutual aid. Interviewees suggested that when the team climate is rather of mutual aid, mutual understanding and friendship, things get more comfortable. Regarding the usage of ITCs, the team climate positively impacts the behavior of knowledge workers. In fact, they feel free from obligations of continuously showing a positive image. They do not fear asking others for help and address the difficulties that they encounter when handling the tool.

> *"It is very clear that there are 'Group collaboration effects' where the concept of 'solidarity is very present'. I have in my group some 'informal reference people' who are very active towards technologies to whom the other members of the group turn to ask for explanations or help…"*

> *"Group networks are very effective. They are also very comforting. I think that they reduce the feelings of anxiety."*

Peers' behavior:

Close to the team climate, data suggested that knowledge workers consider their peers' behavior when setting their strategies to adapt to technostress. Knowledge workers, as part of work groups and organizations, not only try to keep up with level of their peers but also surpass them. Individuals are in a race to be the best; individuals' constant connectivity to work or an individual displaying their capacity to process more information than their peers can create a context of competition within groups.

> *"I have to be the expert on a number of subjects where others are not. I have to be better than the others."*
>
> *"It is important to be at the same level of your colleagues or even better, that is the first thing you learn at a company: the rules of the company, how people see something, how they proceed to make themselves understood."*

Individual Transaction Frame:

Active and Passive Adaptive Response to Technostress

Our data gave insights into two types of responses to disruptive ITCs. They are as follows: 'active' or 'passive' types . The distinction between the two types of responses is based on the adaptive efforts made by users. Active users try to change the situation by initiating problem-focused strategies. Regardless of whether users evaluate the situation as being a threat or an opportunity, they concentrate their efforts on aspects they are able to change or control. We define an '*active adaptation strategy'* as one or many actions engaged by a user in order to change the stressful situation by acting on their personality, feelings, perceptions, work environment or the implemented technology itself. On the other hand, in **'***passive adaptation strategies'*, users prefer to avoid acting on the situation and engage in an emotion-focused form of coping rather than a problem-focused one; actions taken by the user aim to search for an emotional stability by either reducing negative feelings like anxiety or increasing positive ones like satisfaction.

Participants claimed to engage an active adaptive effort regarding either new technologies or technical difficulties.

"The active people actually want to find information and will look for it by all possible means, they will be necessarily overloaded, contrary to the ones that make the least possible effort to do it."

"If I personally need something, I will not stop looking for, I will look everywhere until I find it. If I need to do something specific, I will find it wherever it is…"

"I made it up thanks to small steps. I have worked a lot on the frame of reference? reference system at the beginning of my mission, I have gradually learned to manipulate it. I had to; there were no trainings at that time. We had some short documents but none that went in depth enough. I have gained enough experience on these tools."

Self-enhancement and Categorization

At this stage, we questioned 'what makes workers engage active responses by essentially trying to keep up with the high pace of work with all its aspects previously discussed (technological and work environment -related triggers of technostress) while really techno-stressed out? In other words, what factors are behind accepting to be stressed?

This fact can be explained by knowledge workers' willingness to fully assume the status of 'knowledge workers' implying specific requirements in terms of behavior and attitude. Although their acknowledgment of the constant pressure they work in, they show high capacity to enact the codes that govern their profession. Knowledge workers show deliberate willingness to be categorized as such.

Having the image of being constantly asked for emergencies and interrupted is a sign of higher capacity to handle emergencies and harder work constitute an acknowledgement of one's capabilities. It also generates 'a commitment escalation' process with high levels of self enhancement.

"If I personally need something, I will not stop looking for solutions, I will look everywhere until I find it. If I need to do something specific, I will find it wherever it is….this is how to do work"

"When I chose this career (in a consulting group), I was aware of all this. It was horrible at the beginning. It is still very hard but I get used to it" I don't have time for myself but this the consultant life"

"I need to bear this for 3 more years. Then I will be senior consultant. I will get more responsibilities and less work"

The following table 14 summarizes the various filters that knowledge workers consider to set their adaptation strategy to technostress.

Institutional Transaction Frame	Power and political transactions	Hierarchical Position
		Information Power
	The perception of the organization's technological strategy- related transactions	
Social Transaction Frame	The team climate related transactions	
	Peers' behavior/attitude- related transactions	
Individual Transaction Frame	Categorization	
	Self enhancement	

Table 14: filters of knowledge workers' adaptive responses to technostress

3.4.3. Synthesis of Results

Our model asserts that knowledge workers experience a dynamic process constituted of a sequence of 3 episodes following a certain pattern: 1) Knowledge workers experiencing misfits between what the ICTs are theoretically expected to offer to help better perform tasks and the different reality that they find themselves facing characterized by imbalanced situations in terms of demands and resources; 2) The imbalanced work context resulting from technological and work environment triggers leading states of technostress and a continuous challenging adaptation process; 3) which implies that knowledge workers engage adaptation strategies that are shaped through different transactions between them and their environment. These transactions are held within institutional, social and individual frames.

Indeed, the processual view of this mechanism implies that the three steps constitute rounds of interaction patterns between perceived states of technostress and responsive adaptive actions.Accordingly, we opted for a process model research to investigate the dynamic process of how knowledge workers' adaptive responses to technostress emerge.

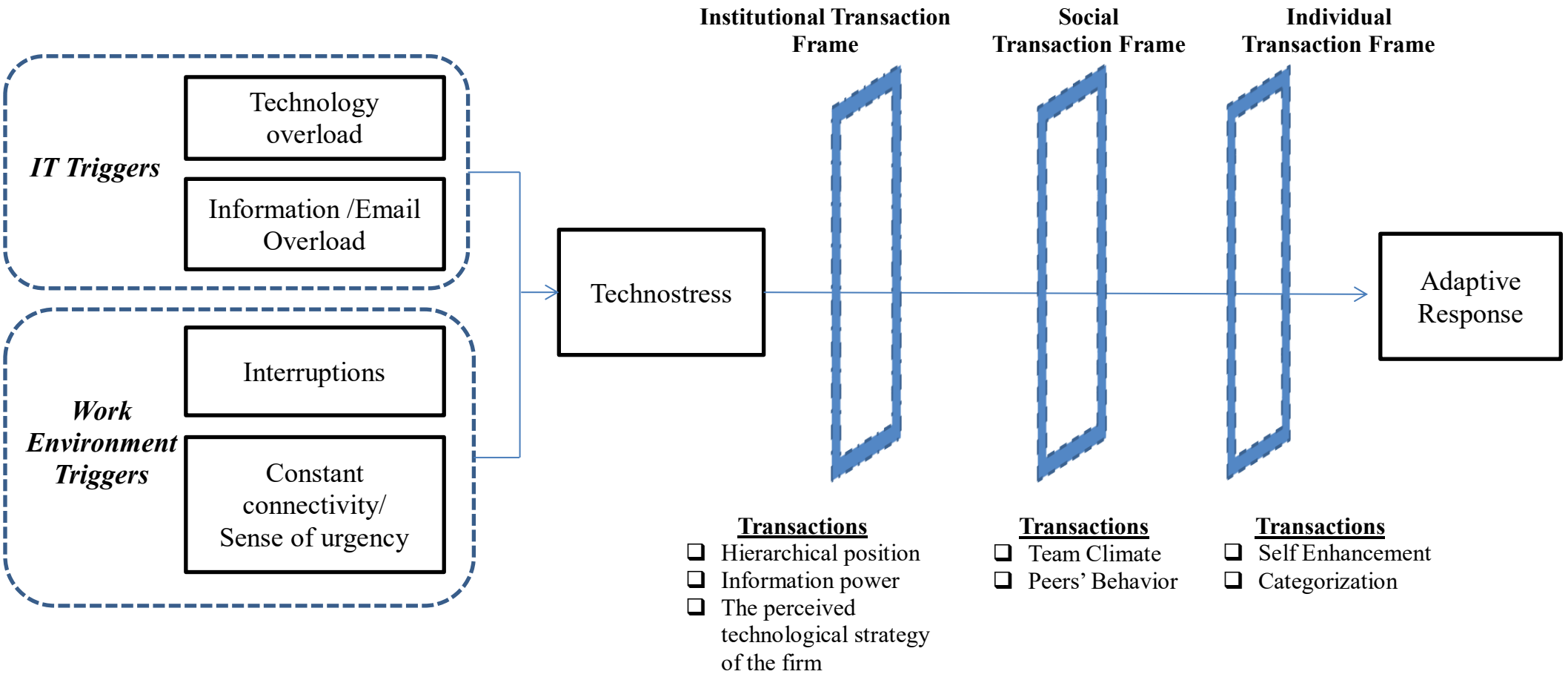


Figure 2: Model (Study 1)

3.5. Discussion

In this study, we addressed two central research questions. We were first interested in applying a misfit perceptive to investigate technostress triggers with an emphasis on technology triggers and work environment triggers. Second, we explored the mechanism through which knowledge workers' adaptive response to states of technostress emerges by proposing a process model with three episodes.

As for our first research question, our interviewees shared that certain dimensions of technostress, as developed by Tarafdar et al, (2007), are more critical than others. What triggers technostress are basically the misfit and the situation of imbalance that knowledge workers constantly experience within the organizational context they work within. For them, technostress is specially an outcome of technology factors as information overload, technology overload, and work environment trigger as the context of constant connectivity, continuous urgency and interruptions.

This study has also revealed, in answering the second research question that the adaptation process that knowledge workers engage towards states of technostress is shaped through the transactions that they undertake with their environment. These transactions are held within specific frames that we classify into institutional transaction frames, englobing the organization's technological strategy, Power and political transactions referring to both the hierarchical position of the knowledge worker has and the information power and withholding issues; and social transaction frame including the team climate and peers' behavior and attitude. After assessing the nature of the adaptive response being either active or passive, we suggest that the individual transaction frame involves categorization and self enhancement.

The processual view of adaptation to technostress

Technostress reflects states of failures in adapting to the organizational computer usage that workers experience on a constant basis. For that, classic perspectives of adaptation to ICTs related disrupting events, implementation, and change that the IS literature proposes can be considered as outdated. Because technostress constitutes a state, trials of adaptation towards it are indeed meant to develop over time. Besides the fact that various filters impact the process of the adaptive response emergence, an equally central idea is the repetitiveness of the process. States of technostress, although continuous, are subject to modifications because certain triggers would be enhanced over others for different reasons leading to cycles of

technostress themselves resulting in cycles of adaptation where different factors are to consider. This episodic and repetitive view is inherently different from the static one that IS researchers adopt to study adaptation to ICTs.

The processual view of adaptation itself has been advanced by IS researchers. For example, Tyre and Orlikowski (1994) argued that the adaptation process to newly-implemented technologies supporting productive operations is not gradual neither is it continuous. They also advanced that the process of adaptation would be a subject for episodic modifications and changes triggered by events or discoveries from users.

This study addresses the same reasoning regarding knowledge workers' adaptation process to technostress. We argue that this process develops over time and is impacted by various factors that would as well engender changes along the process due to the changes occurring in knowledge workers' perceptions about and insights into their relationships with both the technologies-in-use and their work environment's characteristics.

3.6. Contributions to Theory and Practice

Our study has contributions to both researchers and practitioners.

The IS research has not focused on how adaptation strategies help to reduce the harmful effects of technostress in organizations. As far as we know, the literature has covered the technological antecedents of technostress (Ayyagari, Grover et al. 2011), and its outcomes (Tarafdar, Tu et al. 2007, Ragu-Nathan, Tarafdar et al. 2008, Tarafdar, Pullins et al. 2011) (Srivastava, Chandra et al. 2015) without making a link between that and the adaptation dynamics knowledge workers engage toward the heavy use of TICs. Our study has thus established this link.

By investigating the emergence of knowledge workers' adaptive response to technostress, we answered two important calls within the IS literature. First, we added to the comprehension of the phenomenon of technostress, by proposing a different perspective being the technological and work environment misfits that trigger technostress among knowledge workers. Second, we added to the understanding of the shaping of adaptive strategies through 1) changing the context of examination from disruptive events that are limited in time to continuous

technostress; 2) narrowing the target of study from users to knowledge workers whose work has been proven to be the most affected by the introduction of ICTs in organizations.

Equally important is that we have undertaken the individual from a social actor approach adopted by the study. People have been considered as organizational entities whose interactions and tightly depend of their socio-technical affiliations and the organizational context (Lamb and Kling 2003).

From a managerial point of view, this study gives interesting insights and guidance to managers who seek to avoid the fallouts of their heavy investments in ICTs. This study gives answers which help users to better manage technostress. To successfully manage the massive introduction of ICTs in organizations, managers should pay attention to contextual factors that affect the adaptation process of their employees. Stated otherwise, adopting a critical realist view, encourage managers to think about why and how certain decisions lead to certain outcomes while trying to discover what causes them or in critical realist terms what the causal mechanisms are.

3.7. Limitations and Future Research

Of course, the study presents though some limitations that open up new paths of reflection. First, and because our model results from insights of a grounded methodology, it would be interesting to verify these results on a bigger scale through a questionnaire where the different episodes of the model and the relationships between them are tested. This path would enable us to reach higher levels of generalizability of insights. Also, a longitudinal research including in depth interviews and observation would provide insights into both how technostress cycles develop over time and to what extent the workers' adaptive responses follow the same path.

As for the theoretical components, we aim at strengthening the conceptual framework of studying technostress. Given that the majority of works on this phenomenon investigated its determinants and outcomes, little is known about the phenomenon itself (its cycles and how it is really experienced by workers). Also, a novel framework of adaptation to states Vs the events caused by ICTs needs greater focus. Because the majority of researchers consider a static perspective of adaptation, a processual view lacks to IS literature.

3.8. Conclusion

Despite the benefits ICTs offer to organizations, many challenges are worth mentioning to consider such as Technostress referring to the inability to cope with organizational computer usage. Knowledge workers are continuously exposed to states of technostress which leads to a need for continuous adaptation. We propose to shed light on an issue that has received little attention within IS literature: the process of knowledge workers' adaptive response to technostress emergence.

Adopting a grounded theory research methodology, we conducted 20 interviews with knowledge workers from different organizations and industries aiming at getting insights into both the misfits that knowledge workers experience resulting in technostress states and the adaptation paths they engage with the different factors influencing this trajectory.

The model, a summary of our results, asserts that knowledge workers experience a dynamic process constituting of a sequence of 3 episodes following a specific pattern: 1) Knowledge workers experiencing misfits between what the ICTs are theoretically expected to offer to help better perform tasks and the different reality that they find themselves facing characterized by imbalanced situations in terms of demands and resources; 2) The imbalanced work context resulting from technological and work environment related factors lead to states of technostress and a continuous challenging adaptation process; 3) which implies that knowledge workers engage adaptation strategies that are, according to our data, determined by various factors that we classify into institutional, social and individual. Indeed, the processual view of this mechanism implies that the three steps constitute rounds of patterns of interaction between perceived states of technostress and responsive adaptive actions. For that, we opt for a process model research to investigate the dynamic process of how knowledge workers' adaptive responses to technostress emerge.

Chapter 4 : Adaptive Team Performance: An Affordance and Structure of Use Perspective

4.1. Introduction:

Team adaptation is still one of the richest topics in research. The IS literature has known a variety of theoretical concepts posited in studies of group adaptation. Relevant concepts include employee motivations to collaborate (DiMicco, Millen et al. (2008), sense-making (DiMicco, Geyer et al. (2009), organizational learning (Brown and Duguid (1991), dynamics of knowledge development (Griffith, Sawyer et al. (2003), perceived proximity (O'Leary, Wilson et al. (2014); power laws (Johnson, Faraj et al. (2014); knowledge exchange (Beck, Pahlke et al. (2014), besides group identity and interpersonal bonds (Ren, Harper et al. (2012).

However, little is known about 'team adaptive performance' that focuses on the longitudinal enactment of the adaptation processes rather than the outcomes of the team adaptive action. We propose to add to the comprehension of this concept through a focus on the examination of the processes that the team's members exhibit as they confront the new information technology, which has the potential to substantially alter their routines.

More precisely, we propose to draw on the appropriation moves that constitute the adaptive performance of the team by mobilizing two central concepts: *the affordances* (Leonardi and Barley 2008, Leonardi 2011, Leonardi 2013) that are constituted in relationships between team members and the new information technology and *the structure of its use* (Burton-Jones and Gallivan 2007) (Burton-Jones, 2005).

In fact, the relational view of affordances implies considering a relationship between the technology's features, the affordances they offer and the effects (the usage and what results from it). It is suggested that users, only when they perceive that the technology features offer to them affordances of actions, would they appropriate certain features that, if not appropriated, could not afford a social structural change (Leonardi, 2013).

As for the structure of use, it constitutes proxy through which elements about the technology impacts can be more effectively assessed. System usage occupies thus a central place between the IT artifacts and their consequences.

In doing so, we mobilize the revised Adaptive Structuration Theory (DeSanctis and Poole 1994, Markus and Silver 2008). Because it offers a background for the technology structures which a special focus on the affordances concept, the task and organizational environment structures and the team's structures, we thus aim at investigating how the team appropriates these structures.

Thus, this study constitutes an attempt to study teams' adaptation processes to a newly-implemented information technology. More precisely, we will analyze how a group's members within an organization, adapt their work to the capabilities offered by the new information technology: a new webmail to support communication and coordination. We treat the group as a collective that constitutes our unit of analysis.

We seek to answer the following research questions:

> *RQ 1) Which affordances are constituted in relationships between team members and the new tool? What is the structure of usage of the new technology?*
>
> *RQ 2) What adaptations occur when the group migrates from the old tool to the new one?*

In doing so, we rely on the concept of teams' shared mental models to explain how common models about the technology and the team interaction influence the team's adaptation. We also mobilize the concept of 'team's transactive memory' to explain the influence of members' role specialization on the adaptation process.

We developed the theoretical grounding for our study by combining two research streams that we mobilize to answer the research questions, as shown in the table 15 below. Before describing the plan for our empirical study, we discuss each of theoretical concepts in the table.

Research question	**Underlying theory/concept**	**Purpose**
Which affordances are constituted in relationships between team members and the new tool?	Affordances (Leonardi and Barley, 2008; Leonardi, 2011) Structure of use (Burton-Jones, 2005; Burton-Jones and Gallivan 2007)	Compare team members' communications using the new tool as a replacement for the old one
What adaptations occur when the team migrates from the old tool to the new one?	Adaptive Structuration Theory (DeSanctis and Poole, 1994) Revised Adaptive Structuration Theory (Markus and Silver, 2008)	Understand the role of technology structures and social structures in the appropriation process.

Table 15: Research questions and theories

The remainder of this paper is as follows: We will first review the literature about team's adaptation in the IS literature with an emphasis on the concept of 'team adaptive performance'. We then develop our propositions based on reviews of the concepts of Affordances, and structures of use. Afterwards, we present our research methodology, and expose our results. Before concluding, we discuss our results and underline the contribution of this study to both theory and practice.

4.2. Theoretical Framework

The focus of research on teams has known a parallel consistent with the shift in most organizations from individual to team work. It has moved from studying small interpersonal groups in social psychology to focusing on work teams in organizational psychology (Moreland, Hogg et al. 1994); (Levine and Moreland 1990). This latter stream of research has exhibited an evolution from 1900 to 2000 (Bettenhausen 1991); (Cohen and Bailey 1997); (Gully 2000); (Guzzo and Dickson 1996); (Guzzo and Shea 1992); (Hackman 1992); (Sundstrom, McIntyre et al. 2000). One of the major perspectives of team work is reflected in Ilgen, Hollenbeck et al. (2005) and Kozlowski and Bell (2003) who consider groups as dynamic, emergent and adaptive entities that are embedded in a multi-level (individual, team, organization) system which implies that they are themselves complex systems that do not only exist within a larger system but also which adapt over time as their members interact and respond to new situational demands (Arrow, McGrath et al. 2000); (Kozlowski, Gully et al. 1999); (Marks, Mathieu et al. 2001).

Team adaptation has thus been defined in the literature as '*a change in team performance, in response to a salient cue or cue stream that leads to a functional outcome for the entire team. Team Adaptation is manifested in the innovation of new or modification of existing structures, capacities, and/or behavioral or cognitive goal-directed actions*' (Burke, Stagl et al. 2006).

Adaptive Team Performance

The concept of adaptive team performance, which we present here as a construct englobing both the processes of the appropriation of structures and the construction of new structures is interesting because of its multi-level nature. The mobilization of multi-level constructs

strengthens the coherence between the concepts of this study as we also mobilize the system usage construct.

In fact, the adaptive team performance assumes that, besides the fact that it represents a multi-level construct which strengthens our proposition of its use along with the system usage construct, that the team's members undertake a process whereby they change their cognitive or behavioral goal-oriented actions or structures. A second central assumption is that performance does not only reside in the result of the action but rather in the unfolding of the action itself. A group that, facing a new information technology, would engage an appropriation process by which its members interact with the social structures provided by the technology itself as well as other sources (detailed in the model). This process can lead to the formation of new structures. All these actions constitute an adaptive performance.

> *Proposition One: the appropriation process and the construction of new social structures are dimensions of the adaptive team performance.*

Structures

Adaptive Structuration Theory (DeSanctis and Poole, 1994)

IS scholars have created models of user adaptation to technologies, such as 'Adaptive Structuration Theory' (DeSanctis and Poole 1994), the 'Windows of Opportunities' (Tyre and Orlikowski (1994) and The Alignment Model (Leonard-Barton (1988). Although these models focus on different aspects of the adaptation process, they all advance similar notions of an adaptation process – a process by which existing social, organizational, and technological conditions are modified to achieve alignment.

Initiated by DeSanctis and Poole in 1994 (DeSanctis and Poole 1994), the adaptive structuration approach to study the implementation and use of technology has gained much interest given the insights it help to understand about the adaptation process. They have proposed the AST as a framework to study organizational changes that occur as advanced technologies are used by providing a dynamic picture of the process by which people incorporate the new technologies in their work practices. In fact, according to DeSanctis and Poole the adaptation process, is determined by structures, appropriation and decision making.

This approach takes it roots from Giddens' initial theory of social evolution but used to explain how organizations adopt computing and information technology (Barley 1986);

(Orlikowski 1992); (Orlikowski and Robey 1991); (Rice and Gattiker 1999). The central claim being that the implementation and use of technology are not deterministic. Technology and social process rather tend to mutually affect each other in a way that the technology is structured by users in its context of use.

Given this claim, a new understanding of the adaptation process is adopted. It is essentially a process that evolves over time on the one hand and is constrained by the organizational structures (Barley, 1986) and is associated to its task, technology and the group (DeSanctis and Poole, 1994) on the other. The process by which technologies are adapted consists therefore of preexisting conditions (Structures) which form the context where the implementation takes place influencing appropriations which themselves affect decision making.

Structures cover three major aspects:

- The technology's *structural features* (including the sophistication, the restrictiveness and the comprehensiveness) and *spirit* (known as the general guide line that the technology presents to people about how to act when using the system)
- The task and organizational environment (The nature of the task either concerning its complexity or interdependency)
- The group internal structure (the interaction patterns between the group members and the decision-making process).

'Revised' Adaptive Structuration Theory (Markus and Silver, 2008)

DeSanctis and Poole's theory, although very powerful in studying IT uses and effects by developing the concepts of 'structures' and 'appropriation' from a non-deterministic perspective, has received critics regarding the faithfulness of the concepts of 'structural features' and 'spirit' to Giddens's theory of structuration which represents the roots of the AST (Markus and Silver, 2008).

As for the 'structure features' concept, concerns were raised about DeSanctis and Poole claiming that IT have 'embedded social structures' in that that IT have causal properties that can result in behaviors and where IT have a consequential power. Scholars like Bridgman and Willmott (2006), Grint and Woolgar (1992), Grint and Woolgar (1995), Grint and Woolgar (1997) however argue that there is nothing about artifacts themselves that can be

consequential. It is the people's perceptions of and shared beliefs about the IT that have the sequential power which is aligned with Giddens' basic claim that the social structures do not represent material properties nor do they exist independently from the human action. The second concern was raised about the scaling of features in different dimensions and classifying them in core and optional features to avoid the repeating decomposition problem and only focus on features that are more likely to produce effects (DeSanctis and Poole, 1994). This insight has been criticized because considered as an unsatisfactory solution for the repeated decomposition problem especially that the importance of a feature cannot be simply assessed through its presence or not but rather assessed through the way it is technically implemented. The third concern is about the concept of 'spirit of the technology'. While DeSanctis and Poole referred to as 'the general intent' or 'the goals and values' of the technology that form 'the property of the technology', critics have been raised about the human quality by which they characterize the technology especially that the 'spirit' is neither the designers' intentions nor the users' perceptions'.

After assessing the insights that DeSanctis and Poole presented as well as the concerns that scholars have addressed regarding the different concepts of their framework, Markus and Silver (2008), proposed an extension of both the concepts of 'structural features' and 'spirit' by developing three concepts to describe IT artifacts for explaining IT uses and effects, namely: technical objects, functional affordances and symbolic expressions (Markus and Silver, 2008). While the 'technical objects' concept refers to the IT artifacts themselves, both the functional affordances and symbolic expressions pertain to the relations the technical objects and the users. Enrolled in an ecological psychology perspective, Markus and Silver' extension (2008) of the AST concepts, adopts a recognition of the non-deterministically of the action of using an IT but rather that the properties of technical artifacts present affordances information that are necessary but not sufficient conditions of action.

Structures' influence on the appropriation process

Technology's structures influence

Information technologies in organizations are considered as social structures because they enable and constrain the human interaction in the workplace through the actions that the developers of the technology provided for. For example, technologies that support communication and coordination, are supposed to enable humans to accomplish these tasks. In other words, by affording certain capabilities and resources, the technology is shaping the

human action. If we take the example of the technology-enabled electronic messaging, users must follow specific steps to accomplish the task of sending an electronic message. Their action is, in consequence, shaped by the technologies. We propose, in a first instance, to test the three concepts proposed Markus and Silver (2008) as providers of social structures, before hypothesizing their influence on the process of technology appropriation. First, technical objects which refer to the artifact's components, sub-components and the interface can be seen as determining the technology use because in order to see the outcomes of the technology use, the view of its technical properties is a condition. Although the concept of 'technical objects' differs from the 'structural features' concept in terms of defining where the causal potential of technologies lies, we believe that 'technical objects' represent structures. DeSanctis and Poole (1994) considered that the structural power of technology resides in their functional structures unlike Markus and Silver (2008) who consider other properties as sources of causal potential (packaging, appearances, arrangement).

Second, concerning functional affordances, Markus and Silver pointed to the necessity of considering the interaction between humans and technology to form the affordances. This interaction or relationship consists in evaluating the potential usages of the technology taking into account the users' capabilities, resources and goals. Although goal-oriented actions concept spread the idea of the structural features' determinism, functional affordances still represent a structure because they represent potential uses of the technology. If the technology does not afford a functionality, the action would not be enabled no matter the group's goals might be..

Symbolic expressions, on the other hand, is the concept that Markus and Silver have proposed to identify the goals and intents of the technology instead of the concept of 'spirit' proposed by DeSanctis and Poole (1994). Different from the designers' intentions or the users' perceptions, the spirit of a technology rather represents signs about potential understandings of the technology; a claim that both DeSanctis and Poole (1994) and Markus and Silver (2008) agree upon. Differences between the concepts should although be noted. For Markus and Silver, symbolic expressions emerge in relation with the artifacts because different groups with different cultures may not have the same interpretations of the same signs because these latter are not properties of the object. They add by specifying that symbolic expressions have larger scope than values as DeSanctis and Poole claimed. We propose that symbolic expressions represent structures because it can still be interpreted as providing a normative frame which represents a causality potential between technology usage and outcomes.

Proposition Two: The technology-provided social structures would be described/ scaled through three dimensions: the technical objects, the functional affordances and the symbolic expressions and influence the appropriation process.

Task and organizational environment structures

Information technologies are not the only provider of social structures. DeSanctis and Poole (1994) proposed that other sources of structures exist in the workplace. They enumerated the task and the organizational environment. As for the task, it is considered as a source of structure because it constrains and controls the action. A defined task generally determines how the action is accomplished and with which goal to reach. This claim has been supported by other researchers (McGrath 1984), (Poole, Seibold et al. 1985). Concerning groups, the group task as Kozlowski and Ilgen (2006) claimed is a central dimension of a dynamic view of group processes along with the multi-level, the temporal dynamics and the emergent phenomena. The group task can be examined using different approaches. For example, from an organizational perspective of studying teams, the team task is considered as the source of goals, roles and task-based exchange, whereas in the socio-psychological perspective, the team task is simply a means to prompt interpersonal interactions. Very contingent to the task, the role is as well central in the consideration of structures.

DeSanctis and Poole, also proposed the organizational environment as a source of structure. Manifestations of the organizational environment can take the form of pressures, cultural beliefs, corporate information, modes of control and so on (DeSanctis and Poole, 1994, p.128). We propose, under the umbrella of organizational environment, two other sources of structures: the management's expectations and evaluations on one hand, and the relationships that the group has with other groups or entities of the organization on the other. First, the management expectations and evaluations represent a source of structures because they are invoked in the group actions as they constitute a frame for acting. Similarly, the relationships with other groups and entities of the organization represent a source of structure given their potential power of shaping attitudes and forming actions within the organization.

Proposition Three: Role, Task, Management's expectations, Evaluation and Relationships with other entities of the organization constitute sources of structures and influence the appropriation process.

Group's internal structures:

Another alternative source structure is, as DeSanctis and Poole claimed, is the group's internal structure. In fact, the interaction of users with technology results in emergent structures of action. The technology only provides potential patterns of action structuring that might be applied or not depending on the interactions that group of users undertake. The institutionalization of emergent structures only takes place if used and accepted. We propose three dimensions of the group's internal structure: the task-related interactions which refer to the interactions that group's members undertake to accomplish a specific task, the technology-related interaction which pertains to the interactions caused by the technology that the group's members undertake (for example the interaction that occurs between the webmaster of a database and users of the database) and the team climate which represents a frame for interactions.

> *Proposition Four: Task-related interactions, technology-related interactions and the team climate constitute sources of structures and influence the appropriation process.*

The appropriation of Structures:

As for the appropriation step of the process, DeSanctis and Poole (1994) suggest that the assessment of the appropriation of the technology represents the heart of the adaptive structuration theory. It goes through evaluating how the technology's structure are being invoked for or constrained during the use in a specific context and can be assessed by the degree of faithfulness. This latter refers to the degree by which the appropriation follows the initial path or intent that the technology represents to people. The more faithful people appropriate the technology's initial intent; the more likely successful outcomes will result from the decision process.

Affordances

Gibson's (1986) defined an affordance and its relationship with materiality as:

> '*The psychologists assume that objects are composed of their qualities … color, texture, composition, size shape and features of shape, mass, elasticity, rigidity, and mobility…. But I now suggest that what we perceive when we look at objects*

are their affordances, not their qualities. We can discriminate the dimensions of difference if required to do so in an experiment, but what the object affords us is what we normally pay attention to (Gibson, 1986, p. 134)'.

IS Scholars who have adopted this perspective, suggested that mobilizing such an approach would help to better study the relationship between technologies use and effects on organizational change by assessing whether the material from which the object is made offer different affordance and thus produce a variety of outcomes.

In fact, the use of the concept has evolved. While some scholars used it to study how better designs of new technologies are possible (Gaver 1991), (Norman 1990), others mobilized it to study what the dynamics of technologically driven social change are (Orlikowski and Barley 2001), (Zammuto, Griffith et al. 2007). A third stream of research following an affordance approach focused on the relational character of affordances. In other words, the view of affordances as properties of objects or individuals is no longer dominant in the literature. They are rather studied as constituted in relationships between people and the materiality of things which refers to the features of the technological artifact. What is interesting with this view, is that depending of the context, people perceive different goals through the materiality and thus afford a variety of possible actions (Hutchby 2001), (Zammuto, Griffith et al. 2007), (Leonardi and Barley 2008).

Because a relational view of affordances implies considering a relationship between the features, the affordances they offer and the effects (the usage and what results from it); it is suggested that users, only when they perceive that the technology features offer to them affordances of actions, would they appropriate certain features that, if not appropriated, could not afford a social structural change (Leonardi, 2013). Markus and Silver (2008) expressed the same idea in other words. According to them, affordances 'should be understood as potentially necessary but not sufficient conditions for the appropriation moves that users undertake as well as the consequences of their use'.

Research about technologies affordances have showed that the same technology can "support" different affordances which results in different enactments of users (Davern et al., 2012; Kaptelinin and Nardi, 2006). The different enactments of the same technology are the results of the different goals and intentions of users (Markus and Silver, 2008) because affordances, as a relational concept, do not exist independently from users' shaping of their goal-oriented intentions (Leonardi, 2011). Other reasons reside in the multiplicity of affordance enactments reside in the 'repeating decomposition problem' (DeSanctis and Poole, 1994) which is the

reality of the large range of possible affordances resulting from multiple members in a group and a multiple features available for use.

Individualized, Collective and Shared Affordances (Leonardi, 2013)

Individualized affordance concerns the situation when an individual, member of a group, enacts an affordance by developing a specific usage of the technology different from how other members of the group use the same technology. While the enacted affordance can be beneficial for the enactor, other members of the workgroup do not necessarily perceive or use this affordance. Kane and Borgatti (2011) have stated that individualized affordance could be a source of power or status gaining for its enactor over the other members of the workgroup due to his ability to do things that others do not have.

Unlike the individualized affordance which is an individual level construct, collective affordance, which is a group-level construct, pertains to the affordance that members of a group create and aggregate which allow them to perform things that otherwise would not be feasible (Leonardi, 2013). The collective affordance is highly correlated with, on one hand, the interdependence that workgroup members have in performing tasks and their degree of specialization on the other. The more specialized people and the less interdependent tasks are, the more likely the rising of collective affordance is. (Leonardi, 2013). In fact, when work group members perform different tasks that are meant to be aggregated to produce a final output (Thompson, 1967), they are in a way perceiving and using different affordances from the technology which results in different usages of it resulting itself in a different pattern of capabilities that emerge from the usages, all essential to perform and complete the work known as situations of 'pooled interdependence'. Described by Oborn et al. in 2011as '*the unity in diversity*', different usages of the same system are sources of different capabilities all important to do the work.

As for the shared affordance, which can be confusing in terms of distinction with the collective one, Leonardi (2011) defines it as the affordance that is shared by all members of a group. The main difference with the collective affordance lies in the technology features use. The shared affordance implies that all group members undertake similar usages of the technology while the collective affordance postulates different usages by workgroup members, that when pooled help to complete non interdependent tasks. As well correlated with the degree of specialization, teams with high 'reciprocal interdependence' are more

likely to perceive shared affordances. Situations of 'reciprocal interdependence' arise when team members must complete the work through interactions in-between them and dependence on each other as described by Guzzo and Shea (1992). Regarding the affordance of capabilities to workgroup members, the same patterns of technology use that they undertake do not result in differences in capabilities.

Structure of Usage

While researchers emphasize that information systems cause positive impacts on organizations, the unfolding of such a process are still understudied (Burton-Jones, 2005). The question of how the intended positive effects come true still needs examination (Heine et al. 2003; Soh and Markus 1995). One pattern of answers has been developed by researchers such as Soh and Markus (1995), DeSanctis and Poole (1994) and Orlikowski (2000), consisting in the claim that the effects of information technologies only occur when the system is used. Through the 'system usage' proxy, elements about the technology impacts can be more effectively assessed. System usage occupies thus a central place between the IT artifacts and their consequences. System Usage has been, variously conceptualized in the IS literature. Across levels, conceptualizations have been made on the individual level (Reference), group-level (DeSanctis and Poole, 1994) and organizational level (Cooper and Zmud 1990). Researchers also examined the concept through different perspectives. For example, Markus (1994) and Orlikowski (1996, 2000) develop conceptualizations of system usage through practices or change while others like McLean and Delone (2003) and Straub and examined it through individual traits. We are interested in a multi-level conceptualization of system usage as we examine group behavior where individual usage constitutes the single unit. A multi-level conceptualization lies in assumptions that 1) consider constructs as changing from one collective to another and over time. They may exist in one collective and not in another one. Also they may exist in time A in a collective and may not in time B in the same collective. And 2) consider the relationships between constructs as varying across collectives and time and 3) consider the importance of the context.

Burton-Jones (2005) defined system usage as a multi-level construct: '*a user's employment of one or more features of a system to perform a task';* a definition that enable researchers, according to him, to both cover a larger and specific scope that can be used to examine the structure and the function of the construct and to examine each component from various perspectives.

This discussion about the typology of affordances that is built upon the concept of technology or features' use leads us to discuss a contingent construct which is 'the structure of use'. Similar to the affordance construct that has been conceptualized on an individual and group-levels, the construct of 'structure of use', as multi-level IS studies postulate, is essential to explain the use of a new technology on a group level.

What is distinguishable in comparison to the affordance perspective is that multi-level research does not focus attention on the type of task performed but proposes that technology use can be classified upon structure (Burton-Jones and Gallivan 2007), (Kane and Labianca 2011), (Kozlowski and Klein 2000). In other words, the use of the new technology is assessed upon both the frequency of use and the used features. Two types of structure are thus identified: the shared structure and the configurational structure. While the former refers to situations where all group members use the same systems features at almost the same frequency, the latter rather pertains to situations of different usages of the system features even at roughly the same frequency.

Burton-Jones and Gallivan (2007), for example, aimed at offering clearer explanations about system usages in organizations through addressing its multi-level nature. Their starting point was that IS researchers, when studying systems usage on only one level, would not be able to have a real picture about organizations' functioning because they would undoubtedly miss the mutual influence between individual-level and the other levels of organizational work. The result researchers end up with would be, as they claim, '*unnatural, incomplete and disjointed*' (Burton-Jones and Gallivan, 2007, p.658). To rectify that, the authors proposed guidelines for how to conceptualize and analyze the construct of 'system usage' within a multi-level perspective. They, for that, classified guidelines into three main issues that researchers should focus attention on when studying multi-level constructs (they treated the construct of usage on a group-level): the function of usage, the structure of use and the context of use.

Function of usage	The meaning of the construct should be the same through different levels. What usage means on an individual level in terms of the effects and consequences of the phenomenon.
Structure of usage	The fact that usage as a group-level construct should emerge from interactions of lower level. Formed by two aspects, as Morgeson and Hoffman (1991) suggested, the structure of use is a function of the interdependencies in use and the form of the collective usage.

Context of usage	The system usage is based on both the function of usage referring to the factors affecting the construct of usage with other related constructs and the structure pertaining to whether the construct of usage remains the same or changes from one level to another.

Table 16:A multi-level view of the 'usage' construct. Adapted from Burton-Jones and Gallivan (2007)

At this level, we are interested in the structure of usage. As previously stated, the first aspect of the structure resides in interdependences in use. As collective phenomena emerge from lower level interaction, the higher-level constructs should aggregate the lower level constructs.

Applying that to the construct of 'system usage' to examine the collective usage, attention should be focused on not only the sum of individual usages but also on the existing interactions between users forming the collective. The interactions between the system users result in interdependences which imply that entities are mutually dependent on each other. Because one strong critic to this perspective (focusing attention on interactions) is that interactions and interdependences exist everywhere, Burton-Jones and Gallivan (2007) explained that the focus of attention should be on the usage –related interactions and not on other types as the social interaction or the task-related interactions. To assess a collective usage of the system, the interdependences in use should be identified. For that, guidelines have been proposed. Collective usage is thus a function of both the strength of interdependences and the proportion of people directly interacting with the system. While collective usage does not exist in situations of weak or non-existent interdependences-in-use no matter how many users interact with the system, it does exist in two types of situations. The first is when a work group experiences moderate or strong interdependences-in-use while most of members directly interact with the system. The second is when the interdependences-in-use are moderate to strong but a few members directly interact with the system. In this case, the collective usage exists 'by proxy' which means that a difference is highlighted between 'actual collective usage' and 'assumed collective usage'.

The second aspect of the structure of collective usage is in its form. Researchers claim that to examine a collective phenomenon goes by examining how it emerged (the process of emergence) and what patterns of interactions led to it. Basically, different patterns of interactions lead to different forms of collective constructs, as Kozlowski and Klein (2000)

postulated. That's why when applying the same logic to 'collective usage', forms of the collective usage should be examined. Forms of collective constructs are classified into global, shared and configurational. Global collective constructs are constructs which obey to the condition claiming that the level of the origin is at the level of the theory which means that the level that researchers choose for the conceptualization and analysis should be at the level of the lowest basic level at which the phenomenon exists. The shared and configurational collective constructs are, on the other hand, characterized by the fact that the level of origin and the level of theory are not identical; which is the case of 'collective system usage'. While the usage itself come at an individual level (the level of origin), talking about collective usage implies a higher level; here group-level; conceptualization (the level of theory). We are interested in these two latter forms of collective usage.

Shared Collective Usage	Requires homogeneity between workgroup members' usages for example on the levels of frequency and intensity of use.
Configurational Collective Usage	Certain patterns of usage are distinguished among the workgroup.

Table 17: Forms of collective usage.

The use of the new technology, from a multi-level perspective, is assessed upon both the frequency of use and the used features among the group members. Examining the structure of use gives insights into the appropriations moves that the group's members undertake through questioning which features have been used, with which frequency, which have been rejected and why. We propose that the structure of the technology use by the group's members, which we aggregate from individual-level use, would give evidence about the appropriation process.

Similarly, we propose affordances as insightful about the appropriation process. As affordances are not properties of the system, they can't constitute structures. Their conceptualization as constructed through interactions between the system and the user, leads to consider them as part of the appropriation of structures process. In fact, the appropriation moves that the group members undertake '*document how exactly how technology structures are invoked for use in a specific context, thus shedding light on the more long-term process of adaptive structuration*' (DeSanctis and Poole, 1994, p. 133). Affordances represent, we

believe, a dimension of the appropriation because if represents enactments of the technology resulting in specific usages.

> *Proposition Five: the process of the appropriation of structures can be assessed through two dimensions: the structure of use and the affordances (constituted in relation with the technology).*

Team Cognition

Teams shared mental models

When teams face new or/and changing situations, their members are called to adapt. This process of engaging more or less deep adjustments (depending on the situation) occurs on three different levels, to know 1) the team cognitive processes and structures; 2) the team's interpersonal, motivational and affective processes and emergent states and 3) the team action and behavioral processes.

We focus on the first set of adjustments that cover the cognitive processes and structures. We mobilize them to search insights about how shifts and changes occur in team members' minds. Through the four sub-levels of team cognitive processes and structures, we should be able to capture which changes happen when a team is called to adapt.

Team cognition is defined as:

> '*an emergent state that refers to the manner in which important knowledge to team functioning is mentally organized, represented and distributed within the team and allows team members to anticipate and execute actions*' (DeChurch and Mesmer-Magnus 2010)

The value of shared cognition construct: What makes interesting the study of team adaptation through a cognitive lens lies essentially in the variety of elements that shared cognition enables us to cover. First of all, shared cognition constitutes an explanatory mechanism. In fact, to understand team performance, shared cognition provides insights about how team members interact with one other, how they share knowledge and interpret different cues in similar manners and make compatible decisions. Second, the construct of shared cognition can be considered as a predictive variable based on the fact that assessing actual shared cognition enables making predictions about team's effectiveness as well as the team

readiness to take on a particular task. Finally, practioners can also use shared cognition to diagnose teams' problems and give insights into how to solve them.

Transactive Memory

A second emergent state that we explore having an effect on adaptive team performance is 'Transactive Memory'. This construct '*develops as a function of a person's beliefs about the knowledge possessed by another person and about the accessibility of that knowledge. Transactive memory itself consists of meta-knowledge about what another person knows, combined with the body of knowledge resulting from that understanding*' (Lewis 2003). It is basically about systems of cognitive interdependence in between the members of the same group.

Proposed by Wegner in explaining the development of common memory through close personal relationships (Wegner, Giuliano et al. 1985, Wegner 1986), the term 'transactive memory' has initially referred to the theory explaining the shared division of cognitive labor that develops in intimate couples (Wegner, Erber et al. 1991). Transactive memory systems are thought to enhance team work because they facilitates the access to deep and specialized knowledge , thus team tasks are done through the efficient use of a greater amount of task-relevant expertise. According to transactive memory theory, the cognitive labor of team tasks is divided between members specialized in different domains resulting on each member relying on one another to obtain process and communicate information from distinct knowledge domains and thus being responsible for specific expertise. In sum, in deep knowledge and expertise in different domains are efficiently used to perform team tasks.

Despite the differences between descriptions of TMS between researchers; they all agree on the characterization of TMS as 'a form of cognitive architecture' that encompasses both the knowledge uniquely held by particular group members with a collective awareness of who knows what. It has been demonstrated by Liang, Moreland et al. (1995) and Moreland (1996, 2000) that cooperative transactive memory has a positive effect on improving team performance. They showed that group members who are trained together on a task, in comparison with those individually trained, developed specialized sets of knowledge where greater volume of task-relevant information was jointly recalled.

Stasser, Stewart et al. (1995), have as well demonstrated that the fact of mutual accountability for specific knowledge in specific domains has a positive effect on members' active solicitation of information from member experts which ensures that more knowledge is shared and brought to team task.

4.3. Model

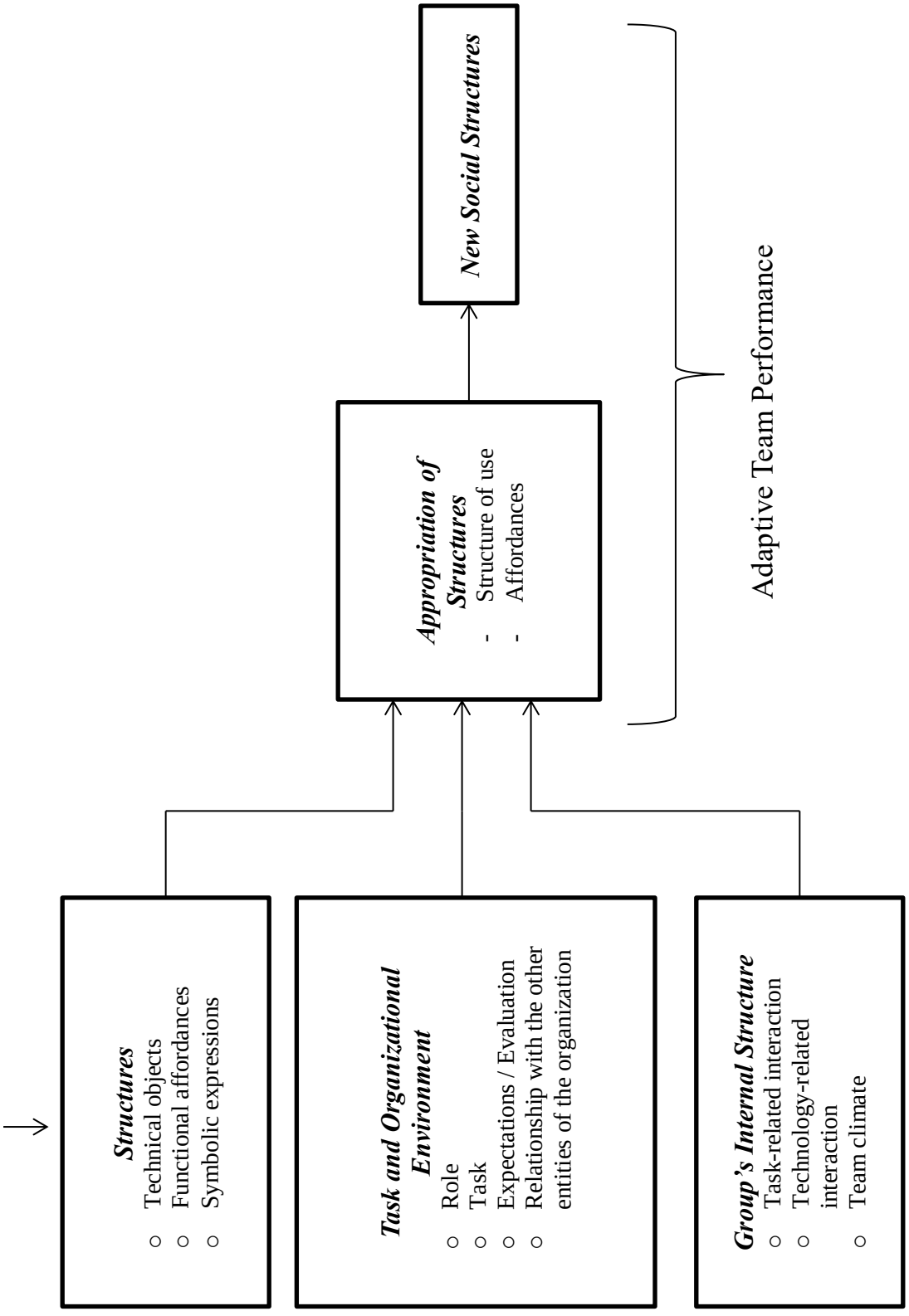


Figure 3: Model (study 2)

4.4. Methodology

To answer our research questions, we opted for a critical realism case study. Following such an approach is considered as the primary research design under the critical realism paradigm (Wynn Jr and Williams 2012). Indeed, it enables IS researchers to develop in-depth causal explanations of the outcomes of a specific socio-technical phenomenon with a focus on the interplay of social, organizational, environmental factors with information technology and the role they play in the occurrence of phenomena. Markus and Silver (2008) as well advocate the use of the critical realism paradigm to search insight about and test the role of IT use.

Different from the positivist tradition more precisely that of Yin (1984), Dubé and Paré (2003) and Eisenhardt (1989), and the interpretivist tradition (Walsham 1995, Walsham 2006) which both aim at answering 'how' and 'why' questions, the critical realism perspective of conducting case studies is concerned with seeking 'what caused the events associated with the phenomenon that occurred' (Easton 2010). Although this nuance in meaning originated in the central focus of critical realism on explaining causality rather than prediction, the main objective of researchers still focuses on understanding the 'how' and 'why' of the mechanisms behind the phenomenon emergence.

4.4.1. Sample Selection

Being a PhD student at Paris-Dauphine University, we opted for Dauphine Foundation as a field. I am a member of the university staff. The university provides email addresses to its staff including the scholars, the doctoral students, the administrative and academic assistants as well as all the workers of the University (IS department, Human resources department…). The university of Paris-Dauphine launched a program of webmail system renewal and the decision has been made to implement and migrate to the new webmail called 'Webmail Partage'. Using a 'Zimbra' technology, it represents a larger package called 'Partage'. Zimbra stands for the 8th version of Zimbra Collaboration Suite. Partage is known, commercially, as an environment of collaborative work dedicated to institutions among the higher education community and offering a range of functions namely: webmail, instant messaging, collaborative directory, task-management, datebook and documents sharing function as well as Visio-conferencing.

All the staff kept their email addresses and had only to migrate and use the new tool. The migration has been made by steps. Launched in October 2014, the staff was informed via emails when the migration will take place. Dauphine Foundation was the last 'department' to migrate to the new tool.

Dauphine Foundation:

Overview:

We are a partnership-based foundation which is a very recent status, from 2007 and our foundation was launched in 2008. We aim to support the university and it can't exist if it is not attributed to the university. Our role is to launch projects and research and raise funds from sponsors and the university Alumnis, other than those collected from the ministry. We are a private structure with a private legal status. We have salaried employees. We are independent but attributed to the university of Paris-Dauphine.

Why Dauphine Foundation?

Reasons for choosing to work with Dauphine Foundation are as follows. The first is institutional. The foundation, by its name and partners is closely related to Dauphine. People working in the foundation have their offices in Dauphine's building and use the same services as the other entities (audio-visual service…). Legally and financially, Dauphine Foundation is a separate entity that has its own budget and sets its own strategy. It constitutes a collective within the collective of Dauphine's staff. As we are interested in a group-level examination of the adaptation process, the group of people constituting the foundation represented an interesting sample to study.

The second reason is methodological. In fact, Dauphine Foundation was the last group within the university to migrate to 'Partage' which would have effects on their migration process and on how they have perceived this transformation through. As the entire structure (the university) already migrated, the foundation's members' behaviors would have been influenced by elements stemming from the context. As we are interested in the adaptation process from an adaptive structuration perspective, this case seems to meet the conditions of our study. Another motivation resides in the number of people constituting the group. We have judged the number of 15 members (we were able to interview 10 of them) as optimal.

4.4.2. Data Collection

Data were collected using semi-structured Interviews. After contacting the administrative assistant of the foundation and conducting an exploratory interview with her, she was convinced of the interest of the topic and launched a request for participation to the entire mailing list of the foundation. She called for participating to interviews about the adaptation to the use of the new webmail, conducted by a doctoral student of Dauphine. The email of the call for participation was entitled "let's help our doctoral students'. Over an entire number of 15 members, 10 answered positively. Time and places of interviews were then set up after individually exchanging emails with the participants. All the interviews were conducted in Dauphine's building during September 2015. One interview was conducted in the cafeteria of Dauphine, 4 in the participants' offices and 5 in the foundation offices (an open space). They lasted between 30 and 45 minutes in a convivial atmosphere.

The interview guide: it was constructed on the basis on the research questions set up earlier when reviewing the literature. Three main parts composed the interview guide. The first part included general questions about the foundation, its vocation, its structure, its role in Dauphine, its relationships with the other entities of Dauphine, and its partners. Another aspect that this first part questioned is the basis of evaluations of the foundation. The second part focused the attention on the foundation as a team. Questions were about the structure/ hierarchy of the group, the interactions within it, the communication and the information exchange, whether tasks are interdependent or not. Participants were also asked about the specialization of each member of the foundation as well as about the team climate of work. Both the first and the second parts were designed to explore the third research question about the shared mental (task-related and technology-related mental models). The third part of the interview sheds light on the technology/ systems adaptation aiming to answer the two first research questions, more precisely about their appropriation of the new structure through an affordance perspective. Questions were varied where I tried to cover the task of the interview and explore the technologies they use to perform it before focusing attention on their journey with the new tool 'Zimbra'. As all the interviewees participated after their migration to 'Zimbra', they were encouraged to recall their first steps with the tool as well as what tool they used before 'Zimbra' seeking to to establish a comparison between both tools. Very direct questions were also asked about emails in general (how many they receive/send per day, how they manage them, which functionalities they use the most…).

Interviews were tape -recorded with participants' approval. They were informed that they will remain anonymous. We then proceeded to the transcription of interviews and analysis.

4.4.3. Data Analysis

Our analysis was conducted following three main phases. First, we proceeded with the content analysis of the interviews; then we develop a response to each existing theoretical proposition of ours. The first step of our analysis consisted in reading the transcribed interviews several times along with the documents that we collected. Data were confronted to several theoretical lenses during analysis. To this end, we used NVivo 10.

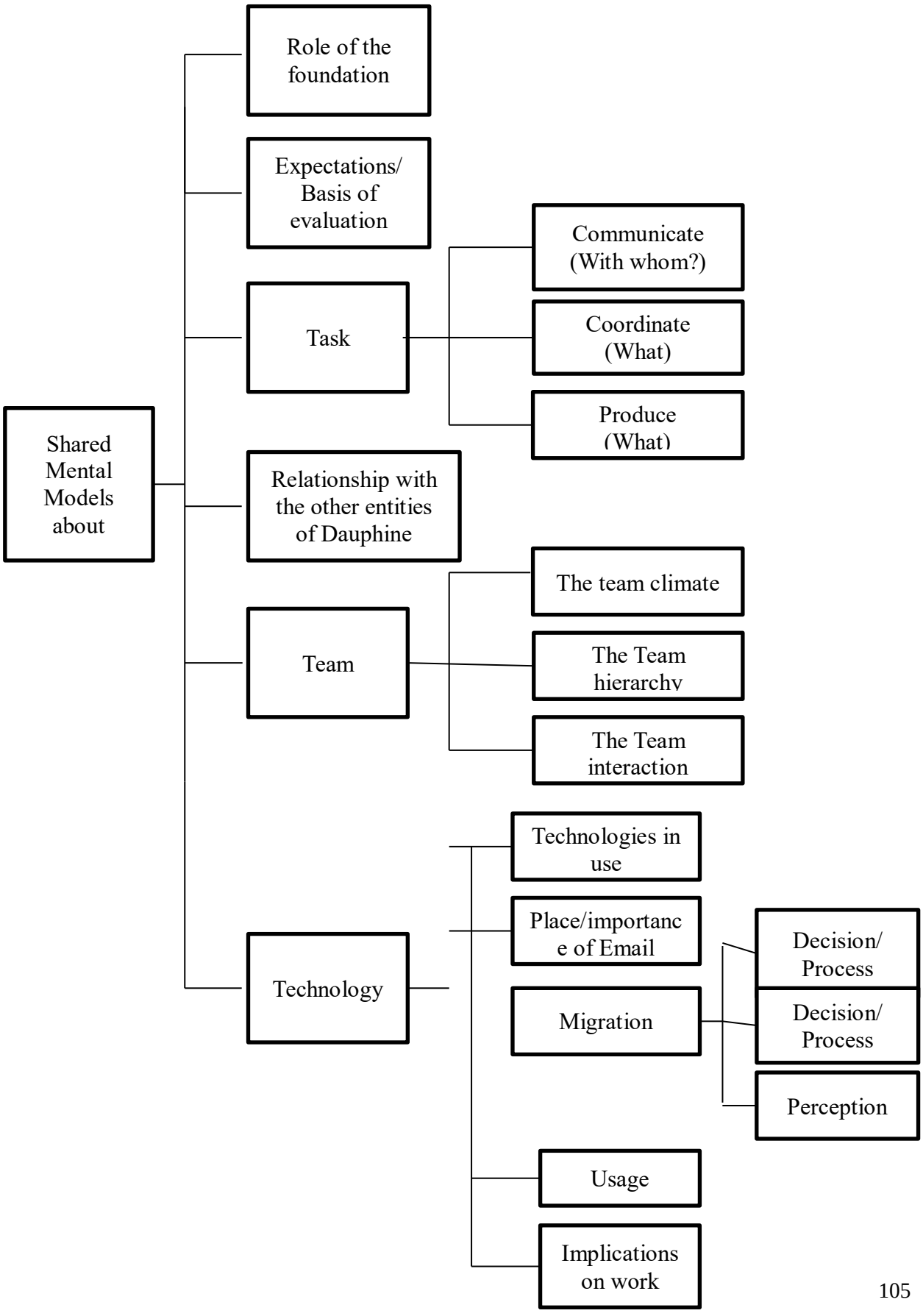
Drawing on the 'Revised' adaptive structuration theory (Markus and Silver, 2008), we developed a coding scheme to assess the different structures that influence and are influenced by the technological event. While structures can reside in the new tool itself, two other sources are important to consider when examining the group-level adaptation namely 1) the task and the organizational environment and 2) the group's internal structures. To collect evidence about these sources of structures in our specific case, we opted for mobilizing the mental models concept. Our objective was to understand the complex patterns of cognitions, behaviors and effects that emerged in interaction with the new tool. That's why we proceeded by individual interviews where individuals, members of the group, were asked about the technology, their task and organizational environment as well as about their group's internal structure.

4.5. As for understanding the process of the structures appropriation we relied on two theoretical frameworks, 1) the affordances constituted in relationships between the team members and the technology and 2) the emerging structure of use. To that end we developed a coding scheme based on the following conceptualizations. Concerning the affordances, we used Leonardi's work (2013) while we used the works of Burton-Jones (2005) and Burton-jones and Gallivan (2007) to cover the structure of usage of the new technology. **Results**

We start by analyzing the data concerning the first component of our model: the structures. As previously detailed, we proposed three sources of structures that affect the appropriation process of the group's members when interacting with the newly-implemented technology.

Shared mental models

In a first instance, we propose a scheme of the different shared models that we studied.


Shared Mental Models about
Role of the foundation
Expectations/ Basis of evaluation
Task
Communicate (With whom?)
Coordinate (What)
Produce (What)
Relationship with the other entities of Dauphine
Team
The team climate
The Team hierarchy
The Team interaction
Technology
Technologies in use
Place/importance of Email
Migration
Decision/ Process
Decision/ Process
Perception
Usage
Implications on work

Shared mental models about the structures:

Technology structures:

In DeSanctis and Poole's (1994) model, the structures have three sources: the technology's structural features and spirit, the task and organizational environment and the group internal structure. Reviewed by Markus and Silver in 2008, the two scholars, after assessing the different concepts of the model, proposed different conceptualization of the structure's sources. They expanded that to technical objects, functional affordances and symbolic expression. In this section, we will assess these different sources of structures in the context of our data.

Technical objects:

The artifact that our study focuses on is a webmail system. Presented as 'an environment of collaborative tools' by its developers, it has been largely recognized as the Higher Education sector's system. Developed with a technology called 'Zimbra', the webmail 'Partage' offers a range of functions namely: webmail, instant messaging, collaborative directory, task-management, datebook and documents sharing function as well as Visio-conferencing.

Functional affordances:

Basic Functions	Advanced Functions
The service offers all the classic functions of an electronic mail Send and receive Management of many inboxes, Automatic reply, Customized filters, Each user can handle more than one electronic address	• The activation of automatic rely when absent • Transfer of an inbox to one or more users. • Share an inbox or a file of messages with other • Transfer and share of messages • RSS flows management • Personal address book management, sharing and transfer • Task sharing management • Agendas management and sharing with possibility of transfer • Integration of invitations received by email in the agenda. • Agendas synchronization with mobile devices.

Table18: Overview of the tool 'Zimbra'. Adapted from 'Partage Webmail' website.

Symbolic expressions: intents and values

The symbolic expressions refer to what intent decision-makers had when opting for the specific technology. In our case, evidence was collected about the intents of Dauphine Executives. First, the main objective was to integrate the university platforms. As each department used its own webmail (Outlook, Mail…), migrating to the same webmail system was imperative as it allows the integration of information and the homogeneity of exchanges. Second, 'Partage Webmail' is known for being the system of Higher Education sector. Dauphine's Executives thus wanted to enhance their belonging to the higher education community. Also, 'Partage Webmail' is supposed to offer more advanced functionalities compared to other webmails. Enhancing the image of a university adopting performing tools can be thus considered as an intent for implementing the technology.

Shared mental models about the task and the environment

As for the task-related mental models, interviewees were asked about four aspects of their task. They were asked to describe the role of the foundation in Dauphine, on which basis they are evaluated as well as the expectations that the management have of their work. Other questions were about the tasks they perform, as well as their relationships with the other entities of Dauphine.

The role of the foundation

Participants share the idea that the core role of the foundation is about promoting the university image through enhancing the different research chairs or other programs. By fundraising and delivering the research results to sponsors, they work on ensuring the link between the sponsor companies and the researchers. The officers in charge of the research chairs and programs constitute the link between the scientific director of the program, the researchers that are part of the program, the companies that sponsor the program and the university.

> *The foundation works on promoting the research dimension of the university work. Basically, we work on communicating and organizing events about all research chairs work. We coordinate their work and communicate it essentially to their sponsors but also to students, professors and the large public. (F. Officier in chief of a chair)*

The role of the foundation is essentially to try to raise funds for the university through its partnerships with companies to finance the research chairs or through private donations from the alumni who are successful in their career and want to help their university. (S. the foundation Webmaster)

Expectations / Evaluations

What is commonly shared among the interviewees concerning the management expectations of their work can be presented into three big ideas. The first is about the amount of funds raised from both the companies that sponsor the research chairs and Dauphine's alumni. The second concerns the relationships they have with the scientific directors of the chairs. They expressed that they work on behalf of these directors because they help them setting and achieving goals according to the sponsoring companies' expectancies. A third dimension which is most present in the interviewees' answers is about the nature of the objectives that are set for them. Officers in charge of the programs share that they work in a more qualitative perspective, where the quality of work and the abilities of managing the communication and the coordination tasks are continuously tested.

It is the amount of the raised funds. It is the result, the figure ate the end of the year.

(Se. Webmaster)

It is hard to say because we are not really evaluated. The concept of a research chair is that, during 4 years, it gets financed by sponsors who expect results from the researchers members of the chair. Because they consider the chair members as consultants, they expect advices and recommendations about their topics of interest.

(F. Officer in chief of chair)

It is a special functionig. Each chair program has a scientific director. We are held accountable to the foundation board by essentially to the scientific director. What they expect from us is to communicate and coordinate and establish links between the University and sponsors, between research and corporations.

(St. Officer in chief of a chair

The expectations are about our ability to manage things. Manage deadlines and being able to set things. The objectives are about the communication and coordination.

(Cl. Officer in chief of a chair)

We are evaluated on the basis of the quality of managing project. Rather qualitative objectives.

(Ch. Officer in chief of a chair)

Tasks

Asked about the different tasks they undertake, the foundation members shared that communicating and coordinating constituted their core activities. We summarize in the following table 19 the different tasks they ensure.

Task	
Coordinate the chair's programs	*My work consists in producing charts, newsletters, set seminars and conferences to promote all what the researchers do within my chair and communicate that to other researchers, professors, corporations and other publics.* *(Fl. Officer in chief of a chair)*
Communicate with researchers, academic directors, sponsors, providers, the university's services	
Managing emails/ contacts	*I coordinate projects of research. I work with researchers and we collaborate with corporations within a system of sponsorship. I ensure the promotion of researchers' work, I prepare events and communicate what is new in the chair.* *(St. Officer in chief of a chair)*
Setting conferences/ seminars	
Managing the budget	
Producing newsletters/ reports	
Managing the website	

Table 19 : Tasks of Dauphine Foundation members (Officiers in Chief of Chairs)

To undertake their tasks, the foundation members use different technologies (webmail, database, Photoshop software, and Office modules). As we are interested in their adaptation to the new webmail system, we asked them about the place of email in their work. They all answered that email is the most important tool they use. Migrating to a new webmail represented thus a central issue among the foundation members who agreed on the fact that mastering the new tool would be a capital thing for their work.

> *It has a central place in my work. We realize that when it does not work. We can't work anymore. When something goes wrong and we don't have access to our inbox, it is the end of the world. All I do, I do it via email, communicating with the university, the researchers, the professors…otherwise I can't' do anything.*
>
> *(Fl. Officer in chief of a chair)*

Oh Email is very important. It the most important thing! Everything goes through emails… there are periods of the year when we receive 100 emails per day. On average, we receive 50 emails a day.

(St. Officer in chief of a chair)

When the internet connection fails, everyone panics. We can't do anything.

(Cl. Officer in chief of a chair)

Because the foundation members are at the heart of the relationships between the university and corporations, communicating is one of their core activities. That's why we opted for further analyzing this task by seeing with whom they communicate. Answers were all about the same partners. They work closely with Dauphine administrative services such as the audio-visual service, the communication service, the planning service and the Crous service. They also work with external providers of services. Some officers in charge of the chairs rely on external providers to work on their website or produce the posters of the events they are organizing. The third major partner they communicate with, is the scientific directors of the chairs.

Dauphine's other services	*I communicate with all the services of the university that I need : the service of communication, the central planning when I organize conferences, the Crous when I organize breaks during the conferences, the audiovisual service* *I communicate with the different services of Dauphine: the audiovisual service, the travel agency to book tickets for conferences participants, the pedagogical engineering unit…*
External providers	*I need also external providers of services to manage the website and the posters' edition. I send them the model and they prepare the poster for me.* *(Fa. Officer in chief of a chair)*
Scientific directors/ academic program chiefs	*I communicate with the professors of Dauphine, the students, the scientific director of the chairs and the external partners.* *(Cl. Officer in chief of a chair)*

Table 20: Communication partners of Dauphine Foundation members.

Relationship with the other entities of Dauphine

One further dimension that interviewees were asked about is their relationships with the other entities of Dauphine. Because the foundation is a private entity that was integrated to Dauphine in 2008, and because they were the last entities to migrate to the new webmail, we found interest in assessing the nature of this relationship. Participants share the idea that Dauphine services see them as external to the university. As they are a private entity, relationships are judged as conflictual.

> *(Laughs) I think that we are an entity apart. They put as apart. It is not easy because I feel like they put obstacles in our way. We have trouble making a place in the university structure, so all our queries represent problems. Even for simple procedures as reprography, we don't have access to the system that all the university employees use. We have, each time, to ask for that and fill in long forms. We are a bit strangers in the university. When we need something, we have to communicate with many people and it goes on forever. Everyone in Dauphine knows that the foundation is something a part and that's hard to live.*
>
> *(Fl. Officier in chief)*

> *The most difficult thing is to communicate with the other services of the university. Because we are the foundation we are considered as external and we have hard time fitting in in the organizational structure. Maybe it is due to a poor communication about our mission so people have wrong ideas about us. We set meetings where we invited some administrative to explain our mission but it didn't change anything.*
>
> *(Si. Administrative assistant)*

> *We are a bit apart. But we try to change things. The objective is that the foundation and the university get integrated. In reality, it is complicated. When we ask for a service, we are considered as different from the other services of the university. Regarding technologies, we don't have access to all the technologies that the other services have. We clearly see that there is Dauphine and there is the foundation while the official position is that we have to be integrated. Theoretically we should be but in facts no.*
>
> *(St. Officer in chief of a chair)*

The team's internal structure -related mental models

By examining the teams' internal structures-related mental models, insights would emerge as to the position of such structures in the process of appropriating the technology. In order to shed light on the team-related structures, we asked participants about three central points: the team climate as a proxy for the spirit of social interactions that occur within the team, the team hierarchy as a proxy for the institutional dimension of the structure and the team

members' transactive memory to highlight the distribution of roles and expertise within the group. We summarize in the following table 21 the different components of the team's internal structure.

The team climate	*Extremely good atmosphere ! We have a very positive ambiance. We communicate very good. We exchange information. Even if I don't share the open space with others, I go there every day to share my coffee time. I stop by to say hello. I love them and want to make sure we don't lose this.* *(St. Officer in chief of a chair)* *During the last 5 years, it has been excellent in our team. I think we would not find this anywhere else. We are also friends and do activities outside the university. It goes beyond sharing the same office. We love organizing cocktail parties.* *(Se. responsable SI)*
The team hierarchy	*It has been always flat between us. There are no hierarchical relations. There is the direction, the officers in chiefs of chairs and research programs and the three transversal functions: the administrative assistant, the communication officer and me, the webmaster. We don't have people who supervise other people.* *(Se.Webmaster)* *Theoretically, there is a hierarchy but we don't feel it in reality. Inside the foundation, we are all equal. Since we have the academic directors to refer to, we don't really the hierarchy in the foundation. We are related to the foundation and that's it.* *(Officer in Chief of a chair)*

The team interaction	*There are events on which we work together. We coordinate in-between chairs if we organize common events. We also work much with the officer of communication because she has to valid every communication we prepare. We depend on her, the same with the administrative assistant. After, we are autonomous when we work on things related to our specific chair or program of research. There a lot of exchange between us but in terms of advices and feedbacks about past experiences. (F. Officer in Chief of a chair)* *There is a high interdependence between the president, the officer of communication, the administrative assistant and me, the webmaster. We work together all time. When we arrived in 2007, the fundraising in universities was not that widespread in France. We had to start from scratch and create everything. We did not have a french model. We looked at what have been done abroad and we tried to make up something. We, four, do everything together, launch programs, raise funds, contact corporations, contact Dauphine's Alumni and then name an officer in chief of chairs and programs to continue to promote the programs that we launched.* *(Se. Webmaster)*
Specialization among the team members	*It is the administrative assistant who handles the administrative side. She knows everything about conventions, legal affairs. For the communication, we rely on the communication officer to finalise the task of communicating. Also there is me to ensure the technical side, organize the database, help on technical problems (Se. Webmaster)* *We have Sebastien, Mr Information systems !! there is also Madam Communication and Madam administrative and legal affairs. It is very* *(F. officer in chief of chair)*

Table 21: Dauphine Foundation Internal Structures

The next figure 4 illustrates the composition of the foundation with the different roles assigned to each function. Roles are presented through verbatims.

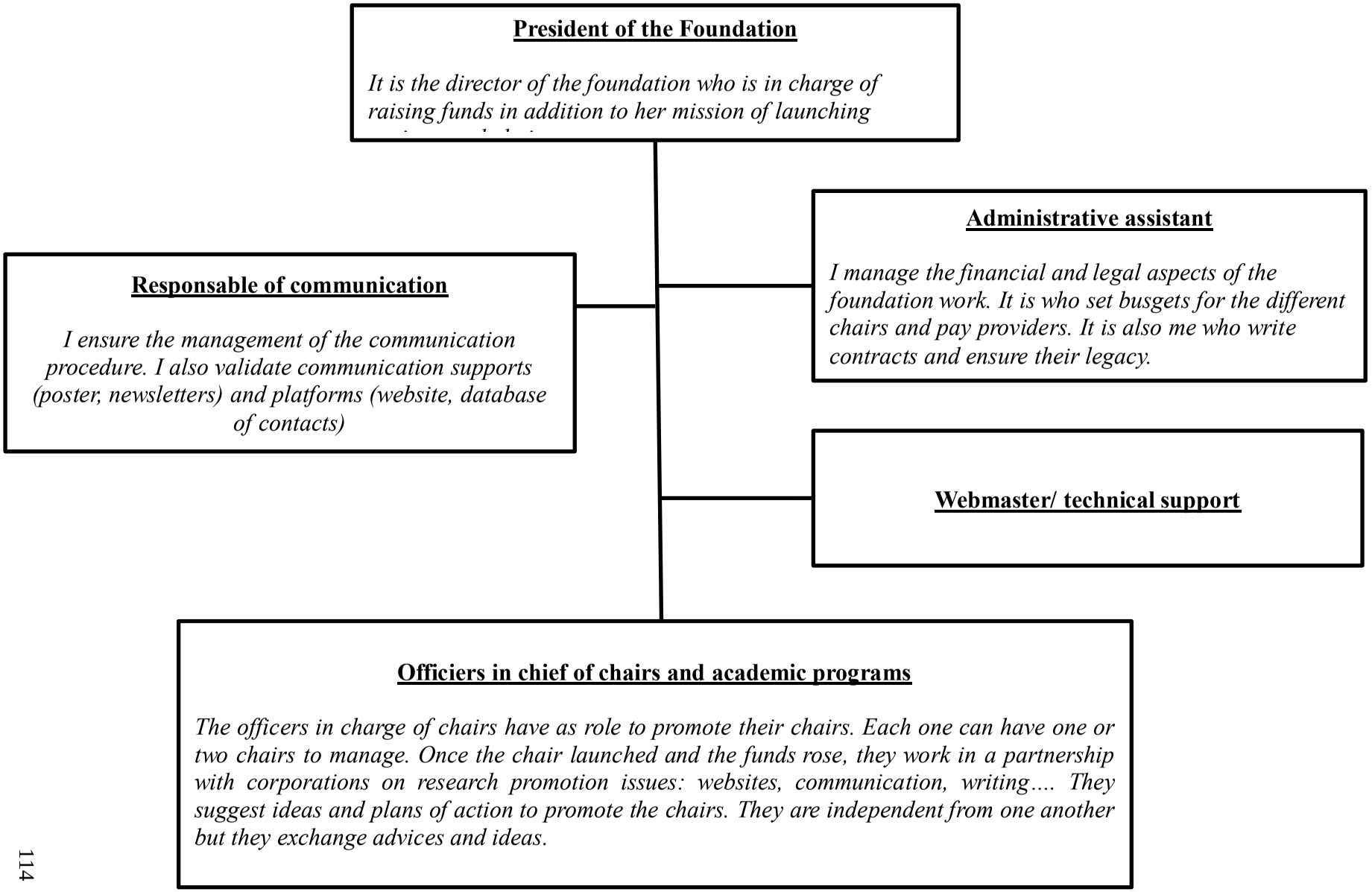

President of the Foundation
It is the director of the foundation who is in charge of raising funds in addition to her mission of launching
Administrative assistant
I manage the financial and legal aspects of the foundation work. It is who set busgets for the different chairs and pay providers. It is also me who write contracts and ensure their legacy.
Responsable of communication
I ensure the management of the communication procedure. I also validate communication supports (poster, newsletters) and platforms (website, database of contacts)
Webmaster/ technical support
Officiers in chief of chairs and academic programs
The officers in charge of chairs have as role to promote their chairs. Each one can have one or two chairs to manage. Once the chair launched and the funds rose, they work in a partnership with corporations on research promotion issues: websites, communication, writing…. They suggest ideas and plans of action to promote the chairs. They are independent from one another but they exchange advices and ideas.

Figure 4: Roles within Dauphine Foundation

The appropriation of Structures

After exposing the different structures related to technology (Markus and Silver, 2008), the structures related to the task and organizational environment in which the team act, and those concerning the team's internal structure, we propose to analyze how they contributed in the emergence of the team's new appropriation moves and to what extent they weighed in shaping the specific appropriations moves that the foundation members engaged. As suggested in the model development, we aim to analyze the appropriation process through two dimensions: the structure of use and the affordances that were constructed in a relation with the new system.

Structure of use

Morgeson and Hofmann (1999) set a list of guidelines that researchers should follow when examining collective constructs. As we proposed to study the group adaptation, the construct of usage that we mobilize as reflecting the process of structures' appropriation, constitutes a collective construct. First of all, when defining a collective, they set the conditions of interdependence and the goal-oriented action of the group members. These conditions are verified in the case under study. Indeed, Dauphine Foundation is composed of 15 persons who work for the same goal: promoting the University image. Despite the fact that the officers in charge of operations work on separate missions, all Dauphine foundation members rely on three centers of expertise: administrative, communicative and technical. Interdependences thus exist between the members of the group we study.

Arrow et al (2000) also proposed guidelines to identify a collective. In order to further prove evidence about how the group we study constitutes a collective, we respond to each guideline.

Principles for Identifying a Collective (adapted from Arrow et al. 2000)	Evidence from the case
Do the individuals consider themselves to be members of a collective (that may, in turn, be part of a larger collective)?	The interview guide addresses direct questions about the place of the foundation in its close environment (the university). The organization chart describes very clearly the foundation as a separate entity with determined boundaries and functions
Do the individuals recognize one another as members and distinguish members from non-members?	The interview guide addresses direct questions about the atmosphere of work within the foundation and their relationships with other departments of the university. The foundation members share the feeling of belonging to the same collective. They insist on the differences between them and other departments of the university.
Do the collective members' activities show more tightly coupled interdependence within the group than with others in the larger collective?	To accomplish their role of promoting the research status within and outside the university, the foundation members follow a specific process where a strong interdependence exists. The direction of the foundation launches chairs and programs of research and rise funds. Officers in chief of chairs are assigned to programs where they depend of three centers of expertise: communication, technical and administrative.
Do members of the collective share a common fate (or consequence) that is not totally shared by the larger collective?	As a private entity which is integrated in the university, the foundation ensures the mission of promoting the research in the university within a sponsoring system with corporations. Programs are launched depending on the capacity of raising funds which is not the case of the other departments of the university that receive funds from the Ministry of Higher

	Education and where the employees are public servants.

Table 22: Principles for identifying a collective. Adapted from Arrow et al., 2000

As for the collective nature of the system usage construct, guidelines of conceptualization have been proposed by Burton-Jones and Gallivan (2007). Based on Morgeson and Hoffman (1989) work, Burton-Jones and Gallivan adapted their guidelines to study multi-level constructs to the construct of 'collective usage'.

Principles for identifying collective system usage	**Evidence from the case**
Do the individuals consider themselves to be using a system as a collective (that may, in turn, be part of a larger collective using the system)?	As the new webmail has been implemented in all the departments of the university, the foundation members have been using the system as all the other employees of the university. They use it to exchange with the foundation members and the external to departments (the other services of the university, the external providers, corporations, researchers, academic directors)
Do the individuals recognize one another as users of the system and distinguish users from other individuals?	The foundation members distinguish the users of the system from non-users. Evidence does not strongly prove that because the whole university uses the same system although they realize that there still are employees who use the old system and the new one and employees who never migrated.
Do the collective members' usage patterns show more tightly coupled interdependence within the group than with others in the larger collective?	As the functional interdependencies (to accomplish the task) are very high is the foundation, the new system is used in this spirit. The exchanges they have are done verbally or through emails.

Do members of the collective share a common fate (or consequence) stemming from their collective use that is not totally shared by the larger collective?	We can consider the tight relation between the foundation mission and the use of the new system. As the foundation mission I to ensure the promotion of the university work in research, one of its central activities is to communique about that which makes the use of the new system capital for them.

Table 23: Principles for identifying collective system usage

After defining the collective system usage, according to Burton-Jones and Gallivan (2007) guidelines, it is recommended that researchers define the structure of the 'system usage'. By structure, it is meant here, whether the construct exists on the individual level, the collective level or both and if so, how it emerged on the collective level. To examine the structure of the system usage, they proposed two steps.

First, researchers should examine the interdependences-in-use that exists between the group members. Second, they should examine the form of the collective usage. Concerning the interdependences in use, Burton-Jones (2005) raised the issue of the relationship between the interdependences and the collective system usage through pointing out different scenarios where different types of interdependence exist leading to an effective collective system usage. The issue has roots in the definition of collective usage itself: 'A collective system usage occurs in situations where users interact and coordinate their work solely via their IT to produce joint output'. This definition reflects only situations where the IT is the central means of interacting between the group's members which restricts the collective usage to the physical properties of the IS leading to a low if not existent recognition of the other structures that influence the collective usage.

Controversially, considering different sources of structures is a central claim of DeSanctis and Poole (1994) to examine the appropriation of structures on a group-level. Thus, Burton-Jones (2005) extended the original conceptualization to two other scenarios where interdependences exist via other means than the IT and where collective usage does exist. The first senario, which reflects the case of our group, concerns situations where the group's members experience interdependences on the level of the tasks they are expected to accomplish so as to produce a joint output. Interactions, in such situations, unfold verbally, face-to-face or using another means: phone or other. The second scenario occurs when the group's members interact via a third party called a meta-user (Orlikowski, 2000).

After assessing the existence of interdependences-in-use in our case, we proceed to examine the form of the collective system usage which represents the second dimension of the structure of the construct.

Forms of collective usage:

In the following table, we assess the form of usage that emerged among Dauphine foundation members. Two types exist, shared structure of usage where the majority of the foundation members used the system the same way and in the same frequency and configural usage where one or more member is distinguished because he follows a different pattern of usage.

In the case of 'Zimbra', only one functionality has been fully adopted: the messaging which is the most basic one and which does not present any improvement compared to the old system. While the new system has been implemented to enhance collaboration through advanced functionalities as schedules sharing, file sharing and instant messaging, the foundation members did not adopt any of those. They kept their old routines with old system and no real changes occurred concerning the usage of the webmail.

Besides, we distinguish a configural usage among the foundation members consisting in the usage the webmaster of the foundation, the commonly followed usage. The webmaster has a very positive opinion about the new system because he considers that, from a technical point of view; it is more efficient than the older, offers more functionalities and helps better manage data storage.

The configural usage has been proven regarding one functionality only which consists in 'sharing schedules'. The foundation webmaster not only used it to set meetings but also turned away the usage. He uses the shared schedules to check if people are available or not so he can call them on the phone.

<table>
<tr><th></th><th colspan="9">1 2 3 4 5 6 7 8 9</th><th>10</th></tr>
<tr><td>Messaging</td><td colspan="9">Advanced usage (filters, labeling, filing, classifying)</td><td rowspan="3">Not migrated to the new system</td></tr>
<tr><td>Address e-book</td><td colspan="9">Not used
(Contacts are managed in excel files to be uploaded in the foundation database of contacts)</td></tr>
<tr><td>Instant messaging</td><td colspan="9">Not used</td></tr>
</table>

Shared schedules	Not used (set meetings verbally or via emails)	Customized Usage	
Task Management	Not used		
Files sharing	Not used		
Visio-conferences	Not used		

Table 24: Configural usage of Zimbra.

Changes in the use of IT and changes in work practices:

Basically, the objective of introducing the new webmail is to enhance and ensure more effective communication and coordination within and across the departments of the University, as well as with the external partners. While the communication was supposed to become easier through functionalities such as improving the basic functionalities of sending and receiving, the management of inbox through customized filters and the possibility to synchronize different inboxes, the coordination was thought to be improved essentially through the schedule sharing feature including functionalities such as personal address book management, sharing and transfer, task sharing management , agendas management and sharing and the agendas synchronization with mobile devices.

Concerning Dauphine Foundation members, the appropriation of the new technology features regarding the communication and coordination was conditioned by various factors. For example, the new webmail didn't really alter their communication routines because it has not offered a completely different way of communicating but rather presented the same basic functionalities of sending and receiving. Although technical improvements exist because the new webmail is technically more efficient and performant than the older one, the functionalities remained the same and didn't trigger any sense of change among Dauphine Foundation members.

Also, the new coordination features have not been appropriated by the foundation members who did not use the schedule sharing features either for their internal coordination or their external one (with Dauphine's other departments and services and external providers) for different reasons. First, regarding internal coordination, Dauphine Foundation members heavily rely on informal procedures to coordinate. While they represent a relatively small group of 15 persons, the majority of them share the same office where they work in an open

space where oral communication is very present; and even the foundation members who don't share the open space with the others, have a daily morning tradition of sharing coffee in the foundation office and a weekly meeting where all of them exchange about their individual tasks, concerns and future plans. Therefore, we can imagine that coordination (setting meetings, approving plans…) is as well done the same way.

Besides, as the interviewees expressed, the team climate is so positive and friendly that the foundation members do not only share the job concerns but are also friends in private life and take part in activities outside the professional sphere. Second, regarding the external coordination, the schedule sharing feature was not adopted for one main reason. The interviewees have spoken about a real separation between the foundation and the other services and departments of the university and clearly expressed their frustration about the problematic relations they have with them. Not considered as a part of Dauphine, the foundation members did not, in our sense, opt for sharing information with the other services of the university.

> *They said it was better for sharing agendas… but I don't know a single person who shares her agenda.*

New usages: Synchronization of the inbox with mobile devices:

All the foundation members that we interviewed adopted the synchronization of their webmail with their mobile devices. They all found that it is an interesting feature which helps them to keep connected to work and better manage emergencies. They informed us that this was not possible with the old webmail. Having access to their webmail helped them much because they, in fulfilling tasks, need to leave the office and spend time in meetings with the academic directors of the programs, the professionals from corporations sponsoring the foundation or in events that they plan.

> *That's interesting. With Outlook, we couldn't download attached files when not in the office. Now with the inboxes synchronized, we have access to all our emails and documents…that's really good!*

Challenges for appropriations

One of the functionalities that the foundation members have found challenging is the 'search' functionality.

> *It is a disaster. The tool is generally very hard to use. The 'search' function is very minimalist. It is impossible to find an email. You have to be super organized otherwise you don't find anything. It is mainly that. The 'search' function is horrible… with Outlook, you find what do you want within two seconds, you type a key word and it's done. Now you need a whole organization strategy and a very strong memory to search things in your inbox.*
>
> *(Si. Administrative Assistant)*

> *It is horrible. You can't filter your emails. You type a key word and you get a long list of results that you don't need. Compared to Outlook, it is beyond compare regarding the rapidity of actions. Also to attach images to you email, it is very complicated.*
>
> *(Ch. Chargée de mission)*

> *Outlook is by far better than Zimbra. There is not the automatic identification of email addresses. The 'search' system is very slow and complicated. In terms of functionalities, it is not better than Outlook even worse. I work faster with Outlook. Now with Zimbra to do one thing, you need one or two additional steps et it wastes my time… Frankly, it is very disappointing…*
>
> *(Fa. Officer in chief of a chair)*

The challenges that the foundation members faced when using the 'search' functionality are due to two main factors: 1) the foundation members have found the functionality not intuitive and 2) they lacked understanding and training on it. Expect the webmaster of the foundation (the only member of the foundation who has a technical and coding background) who found the 'search' functionality 'amazing', the other members faced serious difficulties using it. When they tried to use it the same way they used to do with the 'search' functionality of the old webmail, they did not get any results which frustrated them because their central task is communication with different persons and they continuously need to efficiently search information using key words or even only the first letters of the person' name.

In fact, the new webmail requires that the user inserts the key word in a specific format. If he searches for an email he received from someone, he has to type in the search from://. If he sent the email he searches for, he has to type to://. The foundation members therefore asked the webmaster for help. He explained some basic notions of coding which facilitated the task for them.

This fact raises two issues, the understanding of the new technology and getting trained to it. When asked about their understanding of the reasons of implementing the new webmail, the

foundation members shared the assumption that they ignored why the old technology was replaced because there was prior official communication about that and they were only informed about what they understood from informal discussions within the university which basically concerned objectives of making all the departments of the university coherent through the use of the same technology and improve coordination within and between departments through the possibility of sharing schedules, agendas and contact lists, but no one of the interviewees was sure about what he informed us.

Reasons for implementation, to the foundation members'view, varied between technical improvements, the sharing of schedule and agendas, financial reasons (less costs) and the possibility to synchronize the webmail with mobile devices.

Technical improvements	*I don't even know why. I think because all the university has Outlook and their ENT was very bad.*
The sharing of schedules and agendas	*It is the sharing thing…No?*
Financial reasons (reduce costs)	*I don't really know why we migrated to Zimbra […] because the the IS director did not want to insure the maintenance of other servers than Dauphine ones and add other spendings.* *Nothing else in terms of functionalities. I think they just want to reduce costs.*
The possibility to synchronize the webamil with mobile devices.	*The big thing is that you can connect from everywhere.* *More performant and you can connect from everywhere…*
To unify all the university services	*I think that they wanted to integrate the foundation to the university.* *I don't know but I think they want to unify the university services and tools.*

Table 25: Reasons behind Partage implementation

In fact, when asked about what they thought about the technology before it was implemented, the foundation members expressed, generally, a negative opinion about it. This could be explained by the lack of official communication about the new tool to be implemented and the objectives that the management aimed to reach through the investment in the new technology. Therefore, interviewees informed us that they were frustrated about the migration process since they estimated a high risk of losing emails or contacts, which represents the most important part of their work, when changing from a webmail to another.

> *Honestly, at the beginning, I did not want to migrate because I had to transfer all my information which was complicated. I feared the change of addresses especially that I don't classify all my emails.*
>
> *(Fl. Officer in Chief of a chair)*

> *I was reluctant. I was in a panic that I lose my contacts.*
>
> *(St. Officer in chief of a chair)*

> *We had the migration date a very long time ago because we were supposed to migrate 6 months earlier. We had some feedbacks from the other services that migrated before us. They were saying that it does not work and that is a real disaster.*
>
> *(Si. Administrative Assistant)*

When asked to recall how the migration went through, interviewees informed us that people from the technical support department of the university came one morning, installed the new system and then went without really explaining how to use it or why they implement it.

> *We didn't have any idea about it… they said you will migrate to a new tool and that's all.*
>
> *(Fl. Officer in chief of a chair)*

> *I have heard about it in corridors. Because we are considered as a department of the university, we did not migrate ate the same time with the others. They implemented it in all the other services. Once finished, they moved to the foundation.*
>
> *(Se. Webmaster)*

> *It was complicated!! I was new then and didn't want to make an opinion before I see what it is. I was like: Ok we will see. Everybody was moaning. I hate people who moan because something is changing. I prefer to wait and see.*
>
> *(Cl. Officer in Chief of a chair)*

> *I was the referent for the foundation. The IS people were there and spoke to in very technical terms (pop server, the 191 is blocked…). The girls were unable to understand that so I helped them.*

(Se. Webmaster)

While the migration from the old technology to 'Zimbra' went efficiently for some the foundation members, others faced major problems when IS department experts implemented the new system and launched the transfer of emails, contacts, agendas.

> *For me, it was essentially the transfer of emails that I had on Outlook plus the problems of contacts. I struggled during many weeks. I spent my days on phone with the IT support system to fix that. It was horrible!!*

(Fa. Officer in chief of a chair)

For practical reasons consisting in not interrupting work, the foundation members who had problems with transfer continued to work with the old system and informed us that they would continue to use it because they find it more efficient.

This issue of using a 'shadow system' raises the question of the mandatory nature of using the new system. People who have continued to use the old system are the foundation members who faced technical problems while transferring their information from the old system to the new one. They were therefore given the possibility to have access to both systems while the IS department works on resolving the problems, but no progress has been made regarding that issue and people continue to use the old system since they prefer it.

> *I kept using Outlook. Actually I had a problem with my new inbox. The technical staff said I can keep using Outlook until they fix the problem. They never came back to me and I never asked.*

(Ch. Officer in Chief of a chair)

As for training, and despite the official invitations for training sessions, the foundation members didn't enroll because they didn't consider that mastering a new webmail is that difficult to need training.

> *We received emails to enroll but no one of the foundation went.*

(Fl. Officer in Chief of a chair)

> *There were invitations but I didn't go. I think I had 'a priori' about people who will attend it and very low expectations about what I will learn from it. I thought they will show us how to send and receive an email which is very simple.*

(Cl. Officer in Chief of a chair)

> *No but I don't think I need a training. It is a webmail after all.*

(St. Officer in Chief of a chair)

But after the first contacts with 'Partage', the foundation members, again expect the webmaster, admitted that given the difficulties they faced especially in understanding the 'search' functionality, attending trainings would have certainly been helpful. In fact, official communication about trainings was very general and didn't propose detailed programs of trainings. The foundation members only received an email with dates and hours of training to enroll and therefore estimated that attending a training about sending and receiving an email would be a waste of time for them, since they estimated that people who would attend the trainings would not have the basic notions about using a webmail.

If I had heard about training concerning the 'search' function, I would have certainly enrolled.

Affordances

To examine the appropriations moves that the foundation members engaged toward the new webmail system, we proposed to mobilize the concept of affordance through which we argue that the adaptation process is constructed through the relation between the technology features, the affordances they offer and their effects.

As exposed earlier, affordances do not exist either in the artifact or in the user but they exist in relation between them to generate effects; therefore, we collected evidence about affordances at two levels: the functional affordance of the new technology and the affordance that has been offered in relation with users (here the foundation members). To illustrate how the same features would have different effects on usage due to the affordances that a certain user perceives in a relation with the technology, we rely on the comparison between two types of users among the foundation members: the officers in chief of chairs and the webmaster of the foundation toward the 'search' functionality.

We distinguished two types of affordances and propose a new type of affordance that emerged from our data.

First, data revealed that the foundation members expect the webmaster, shared the fact that they faced serious problems using the 'search feature' of the new webmail system. While it was easy to visually recognize the search…, the attempts to use were not successful because they tried the same procedure as they used to do with the old system. The affordance they have built when interacting with the new tool were somehow constructed in comparison with

the same function in the old tool and the relation between them and the feature which constitutes the basis of the affordance was impacted with previous experiences.

We suggest adding to the typology of affordances the concept of '*relative affordance*' which refers to the affordance which is constituted in relation with the technology features but in a comparison with a previous similar experience with a similar technology. The second type of affordance that data revealed is the affordance that was constituted in the case of the foundation webmaster. As he has a technical background, the Foundation webmaster saw things differently from the others. First, he claimed that the new system is more efficient compared to the old one and that the university opted to implement it to reach higher performance and to better manage servers and storage spaces and access rights. He claimed in addition to the higher efficiency, new functionalities such sharing schedules and synchronization with mobile devices made the new system by far better than the old one. He also talked about technical details that made the inboxes and storage spaces easier to manage by the IS department experts.

> *Sharing calendar is amazing because you can share all the schedules of Dauphine's employees. You can plan a meeting automatically instead of planning it the oldest way. if you look at the functionalities, you easily find 'Planification', you type the name of the person you want to meet with and you directly see if she is available. Before sending the invitation, you can say if she will say yes or no. this is really a fantastic functionality!! You can even make divert usage from it. If you want to call someone and be sure that he responds, tu click on plan a meeting and you will see if he is available.*
>
> *Before implementing Zimbra, we struggle to share calendar. For example, inside the foundation, the president and the administrative assistant opted for sharing their calendars. It was not possible with outlook. We had to set accounts on google calendar through Outlook and that was complicated and did not work perfectly. With Zimbra, you have that directly.*
>
> *Even for sending files in intern, I don't know if the girls realize how is it amazing!! When we send files, you don't send to the inbox, you only download which is left in Dauphine's servers. They don't realize that but it is really amazing!*

When asked about the 'search' functionality, he expressed a totally opposite opinion than his colleagues. He did not face any problem using this functionality because he considers he has the required technical background that enables him to understand how it works.

Really?? for the user who has only basic knowledge, it might be complicated to use Zimbra. But, when you did some computer development in your life, you master all the functionalities and it is 10 times more efficient than Outlook. that is true, the girls did not understand from the beginning that they have to type 'from' or 'to' and that there is no need to scroll through all the list...

I find Zimbra amazing, again it is certainly due to my technical reflex. I consider myself more than advanced in computer knowledge

Adaptive Team Performance:

In our model, we proposed the construct of 'adaptive team performance' to describe the process englobing the appropriation of structures and the emergence of new ones. Evidence showed different dimensions of the appropriation process. The 'Partage' technology presented a large set of functionalities that the foundation members a) don't know about; b) find too complicated; or c) resist for some other reason. As the construct suggests, the adaptive team performance represents an action engaged in time influencing the construction of emergent states, here the adaptation to the new system. The adaptation of the foundation as a team to the new webmail would know changes over time if changes occur in the structures guiding the individuals' actions or in the goals, either cognitive or behavioral, that orient their actions. The foundation members' answers to our questions didn't reveal major changes in the use of the new information technology or in their working practices for different reasons. First, data were collected just a little time after the new webmail was implemented; we can thus imagine that for the changes in behavior or beliefs to occur, more time is needed to ensure the recursive cycle of the mutual influence between the new demands of the new situation and the existing dynamics of structures and cognitions in orienting the collective action. Second, we think that the nature of the newly implemented technology was not enough challenging in terms of disturbing routines and inducing profound changes. Consisting in a new webmail, the foundation members did not feel the need for big changes in the way of conducting work. Although one of the major goals of implementing the new webmail was to establish a more collaborative context of work, the existing dynamic of work hampered the implementation process thus representing barriers to that. As the foundation members constitute a group which is considered as external to the university, the relationships between the group and the other entities of the university are complicated which hardens the establishment of collaboration spirit. Besides, the decisions-makers have not communicated concerning the

objectives of implementing the new technology which blurred the context of migration and the team's members lacked a clear frame for the new situation.

4.6. Discussion

We addressed in this study the questions about the team's adaptation to a new technology and proposed a theoretical framework that links three key concepts: the structures, the appropriation and the team adaptive performance. To assess how the adaptation process that the team engaged towards the new technology was , we used the individual shared cognitions as reflecting their evaluation of their current situation and how the technology has altered (or not) their work procedures and routines. We, first of all, collected evidence about the structures that are supposed to guide the individuals' actions then we divided the structures into three classes: 1) the technology structures based on Markus and Silver's propositions (2008) to evaluate what guidelines the implementation of the new technology would establish through its functionalities and spirit, 2) the task and organizational environment structures to assess the organizational structures and how work is organized within the team and in relationship with the organization, and 3) the team's internal structures to see in depth the internal dynamics that guide the collective action of team. We then mobilized two concepts to draw the process by which the team members appropriated the technology in a relation with the set of proposed structures. As we proposed a group-level consideration of the adaptation, we evaluated the appropriation process through the structure of collective usage of the new technology as well as the affordances that were constituted in a relationship with the technology. Once the appropriation process analyzed, we proposed to address the adaptation process through the concept of 'adaptive team performance' to further explain the recursive cycle that such a process knows over time so that profound changes occur leading to the emergence of new structures.

4.7. Contributions to theory and Practice

By doing so, we contributed to the literature in different points. First, we added to the comprehension of the adaptive structuration theory (DeSanctis and Poole, 1994) by applying the propositions of Markus and Silver (2008) and overcoming the different criticism that the

AST has known. To endorse our taking on the non-deterministic nature of technologies, we introduced the concept of affordances as one dimension of the appropriation process. In fact, Markus and Silver (2008), by proposing the functional affordances as a source of structures. But the concept of affordances postulates the importance of the mutual influence between the technology structures and humans that not only influence the appropriation process but constitutes rather a dimension of the appropriation.

We also proposed, a new type of affordances that we add to the existing typology of affordances, a new type consisting in the 'relative affordance' that refers to the affordance that is constituted by comparison to prior ones with similar technologies.

Minor contributions consist insisting on the phenomenon of 'shadow systems' that has been the focus of previous studies as well as about the place of the management communication about new technologies implementation that, when poor, leads to blurred acceptance and adaptation processes.

Our second contribution consists in mobilizing the construct of 'IT usage' with its multi-level nature. As we proposed to focus on the adaptation on the group level, we answered a call from researchers (Burton-Jones, 2005; Burton-Jones and Gallivan, 2007) to rigorously address the usage construct when studied as a collective construct. By answering the different theoretical requirements of 1) identifying the group under study as a collective and 2) identifying how they collectively use the system through the emphasis on the interdependencies-in-use that the group members show when fulfilling their tasks.

A third theoretical contribution is in applying a process view of the group adaptation. We did not mobilize the group adaptation as an objective or a result of an action but rather as a continuous action over time that compiles successive adjustments that individuals undertake to fit to the new situation (here the replacement of the main technology that they use to accomplish work). The concept of 'adaptive team performance' that we proposed in our model to refer to the process englobing the appropriation process and the emergence of new structures gave us insights into how the adaptation process takes place and evolves over time and about how humans and technology mutually influence each other to produce new structures.

For managers, our study is of importance because it addresses a crucial question about the team adaptation in organizations to new information technologies that deeply alter the work

procedures and routines. In fact, as organizations nowadays rely more and more on groups to fulfill tasks, the undertaking of the collective nature of behaviors is a must-consideration for managers. The IT usage is as well a central issue in organizations nowadays. Given their continuous investments in information technologies aiming at reaching a better performance, the use of these technologies still represents a challenging question for managers. Our study gives insights into how to assess the collective usage of a newly-implemented technology within groups. Equally important lies the recognition that managers should have about the adaptation as a process and as a dimension of teams' performance. The adaptation should not be seen as an objective per se but rather as an emergent state that evolves over time.

Chapter 5 : Organizational Adaptation to Information Overload: An Organizational Learning Perspective

5.1. Introduction

According to a Deloitte Consulting (2011) report, "*Social software presents a set of unique capabilities to address operating challenges and improve operating metrics. Companies that embrace this opportunity will have a distinct advantage over their competitors…"* Organizations continue to increase their spending on IT investments (Gartner (2014), where collaboration technologies and social software constitute an increasing fraction of these investments, given their benefits to productivity, as well to innovation and knowledge management (Deloitte (2011). To ensure achieving returns from such investments, organizations must ensure the successful adaptation and usage of these technologies (Burton-Jones and Straub Jr 2006). Scholars have noticed that organizational spending on social media is outpacing studies of the uses and outcomes associated with these tools. They argue that research should focus on how this new class of technologies profoundly alters organizational dynamics. One way of responding to this call is to investigate how employees adapt themselves to the use of these "social software" tools that deeply alter the work processes and even the spirit of teamwork.

In this study, we trace one firms' adaptation to shifts in its technological and industry environment. Mobilizing the notion of 'technological frames' (Orlikowski and Gash (1994), we explore how senior managers' cognitive frames about the role of ESN technology evolved, using an organizational learning lens. Specifically, we focus on the firm's launch of a 'Zero Email' initiative, where workers were expected to substitute a new ESN technology, replacing all email communication.

The focus on studying ESN is grounded on our recognition that there is a lack of studies about ESN in the IS literature. While related topics, such as e-collaboration (Riemer, Steinfield et al. 2009) and "online communities" (Kudaravalli and Faraj (2008); Faraj, Jarvenpaa et al. (2011); Ma and Agarwal (2007); Lee, Vogel et al. (2003); Ren, Harper et al. (2012); Chen, Xu et al. (2011); Preece (2001), have received attention in the literature, the newer generation of social media tools (here labeled as ESN) have yet to draw much attention. Recent studies have proposed the notion of ESNs as a new generation of communications tools to support work teams. For example, (Treem and Leonardi 2012) have argued that social media technologies (blogs, wikis, social networking sites, micro-blogging tools, etc.) exert different effects on employee communication compared to traditional computer-mediated-communication (CMC) tools (Grudin 2006); (McAfee 2006); (Steinhuser, Smolnik et al. 2011)).

Of course, the theoretical concepts posited in studies of older technologies may serve as a useful baseline to explore the newer tools. Researchers have mobilized relevant concepts to study the impact of technology on organizational work such as employee motivations to collaborate (DiMicco, Millen et al. (2008), sense-making (DiMicco, Geyer et al. (2009), organizational learning (Brown and Duguid (1991), dynamics of knowledge development (Griffith, Sawyer et al. (2003), perceived proximity (O'Leary, Wilson et al. (2014); power laws (Johnson, Faraj et al. (2014); knowledge exchange (Beck, Pahlke et al. (2014), as well as group identity and interpersonal bonds (Ren, Harper et al. (2012).

Accordingly, this paper addresses the theoretical gap surrounding the link between organizational adaptation and learning from a managerial cognition lens. Indeed, we posit that mobilizing the organizational learning frame of analysis, would add to the IS literature about the comprehension of the usage of ESN in organizations and the impacts resulting from their integration within organizational processes.

We aim to answer the following research questions:

> *RQ 1: How do organizations adapt to technological change?*
>
> *RQ 2: To what extent can organizational adaptation be considered as a process of organizational learning?*

The remainder of this chapter is organized as follows. We review the difference that the literature has pointed between our central concepts: organizational adaptation and organizational learning. A second part of the literature review focuses attention on the 'technological frames' as a cognitive means of detecting and interpreting technological change. Considered as basis for organizational adaptive actions, we conceptualize the impact the shifts in managers' technological frames on the organization's learning systems. We then present our model and propositions. After detailing our methodological approach, we expose and discuss our results. Various theoretical and managerial contributions will be as well developed.

5.2. Literature Review

5.2.1. ESN in the IS literature

In their essay about enterprise social media in organizations, Leonardi, Huysman et al. (2013), proposed a definition as well as a typology of social media used in organizations. They have defined it as '*Web-based platforms that allow workers to (1) communicate messages with specific coworkers or broadcast messages to everyone in the organization, (2) articulate a list of coworkers with whom they share a connection, (3) post, edit, and sort text and files linked to themselves or others, and (4) view the messages, connections, text, and files communicated, articulated, posted, edited and sorted by anyone else in the organization at any time of their choosing*' (Leonardi, Huysman et al. 2013)

Although there exists a variety of corporate applications (eg. the knowledge management systems) that enable workers to do one of the four parts of the definition above, the enterprise social media is still unique because, as Leonardi, Huysman et al. (2013) propose, it offers in addition to the ability to perform the three first activities in one place, the opportunity to record, store and make available to all the coworkers for consultation at any time (Treem and Leonardi 2012).

It is important to highlight the difference between two generations of communications tools in organizations. The literature has argued that social media technologies (blogs, wikis, social networking sites, microblogs or social-tagging tools) have a different effect on facilitating communication practices compared to traditional computer-mediated-communication (CMC) technologies (Treem and Leonardi 2012) ; (Grudin 2006); (McAfee 2006); (Steinhuser, Smolnik et al. 2011).

While related topics, such as e-collaboration (Riemer, Steinfield et al. (2009) and "online communities" (Kudaravalli and Faraj (2008); Faraj, Jarvenpaa et al. (2011); Ma and Agarwal (2007); Lee, Vogel et al. (2003); Ren, Harper et al. (2012); Chen, Xu et al. (2011); Preece (2001), have received attention in the literature, the newer generation of social media tools (here labeled as ESN) has yet to draw much attention.

Thus, many scholars have noticed that organizations' investment in social media is outpacing empirical research about the use and effects of these tools. They suggest that research has to focus on how profoundly this new class of technologies alters the organizational dynamics.

Our study answers such calls by exploring the adaptive process through which managers decided to adopt an ESN, in response to the shifts they know in their technological frames, and how it has affected the organization's learning system. We combine two streams of research: managerial/ social cognition and organizational learning.

5.2.2. Organizational learning and adaptation

Organizational Adaptation

While individual adaptation refers to '*A person's cognitive and behavioral efforts to manage specific external and/or internal demands which are appraised as taxing or exceeding the person's resources*' (Lazarus and Folkman, 1984), organizational adaptation has been defined as '*modifications and alterations in the organization or its components in order to adjust to changes in the external environment*' (Cameron, 1984). In fact, in order to restore the equilibrium in imbalanced situations, organizations engage in a process of change. Adaptation can be engaged as a reaction toward environmental change or as an anticipatory action but in order to achieve the same objective; respond to a misfit between the organization and its environment.

Studies about organizational adaptation presented different positions that lead managers to adapt. While strategy theorists like Boeker (1989), Hannan and Freeman (1984), Kelly and Amburgey (1991), Salancik and Pfeffer (1978) or Quinn (1980) see managers and thus organizations constrained to adapt to environmental changes, others like Chaffee (1985), Child (1972) or Schendel and Hofer (1979) suggest that managers are more proactive and engage change actions as a reflection of the environmental changes.

Another stream of research focused on explaining organizational adaptation. Hrebiniak and Joyce (1985) suggest that understanding organizational adaptation can be done through the study of the interaction between strategic choice and environmental determinism. In fact, one of the major issues that researchers studied is whether organizational adaptation is managerially or environmentally derived which have been considered as mutually exclusive status.

A third stream of research focused on the states of adaptation. Chakravarthy (1982), for example developed a framework and distinguished three adaptive states of organizational adaptation; high-level, medium-level and low-level of adaptation. To survive the environment

conditions, organizations adopt one of these states according to their ability to adapt. Jennings and Seaman (1994) extended Chakravarthy's (1982) framework by developing links between the level of organizational adaptation and the organizational strategy and structure and analyzing performance relationships.

Researchers agreed on basic claims about organizational adaptation consisting in the willing of organizations to respond to changes in their external and internal environment that challenges the existing organizational conditions. In other words, when misfits between organizational conditions and its internal and/or external environments occur, efforts are made.

Organizational learning:

Organizational learning represents one of the most attractive topics for researchers in various fields. In fact, the concept of organizational learning has been developed since the seminal work of Cyert and March (1963) and Simon 1969 who defined organizational learning as '*the growing insights and successful restructuring of organizational problems by individuals reflected in the structural elements and outcomes of the organization itself*'. The definition implies two parts that are the change that occurs in individuals' mindsets and states of knowledge and the change that is more visible on the organizational outcomes. While interesting, it created confusion (Fiol and Lyles 1985) in organizational learning research. In fact, reviews on organizational learning pointed out the problems and difficulties regarding both defining the concept and agreeing on theoretical models (Fiol and Lyles 1985), (Huber 1991), (Crossan, Lane et al. 1995), (Gherardi 1999)

Organizational learning has been defined as				
New insights or knowledge	New structures	New systems	Mere actions	Combinations of the previous
Argyris and Schon (1978) Hedberg (1981)	Chandler (1962)	Jelinek (1979)	Cyert and March (1963)	Bartunek (1984) Shrivastava and Mitroff (1982)

Table 26: Various definitions of organizational learning. Adapted from Fiol and Lyles, 1985

The confusion did not only occur concerning defining the concept but also occurred when the organizational learning concept was used by researchers interchangeably used it with adaptation (Meyer 1982), (Chakravarthy 1982); change (Mintzberg and Waters 1982) or even

unlearning (Starbuck, Greve et al. 1978) when referring to adjustments that organizations engage towards its environment.

However, Fiol and Lyles suggested a basic definition of organizational learning: '*the process of improving actions through better knowledge and understanding*' (Fiol and Lyles, 1985, p.803). Along with this definition, other researchers, drawing on the same basis, developed other conceptualizations. Huber (1991), for example, focused attention on how organizations and which process they follow in doing so. He suggested that '*an entity learns if through its processing of information, the range of its potential behaviors is changed.'* He developed constructs like knowledge acquisition, knowledge distribution, knowledge interpretation and organizational memory.

Other researchers like Chandler (1962), Katz and Kahn (1966) and Thompson (1967), focused on the necessity of aligning the organizational learning process with the environment in order to maintain competitive advantage and ensure long term survival. Another issue consisted in exploring the contextual factors that affect the organizational learning. Contextual factors are, according to Fiol and Lyles (1985), refer to settings and conditions in which the organization work. They enumerated the corporate culture, the strategy, the structure and the environment.

Equally interesting is studying the relationships between individual learning and organizational learning (Martin 1982), (Mitroff and Kilmann 1976). Researchers recognize that despite the fact that organizations are formed by individuals; the organizational learning is still different from the individual one. Through their cognitive systems and memories, organizations enlarge its learning beyond the accumulation of its individuals' learnings.

5.2.3. Organizational learning in the IS literature

The IS literature has known an interest in mobilizing organizational learning concept as a frame to examine different IS-related topics. On the theoretical level, organizational learning has been integrated in the knowledge management and sharing sphere (Baskerville, Pawlowski et al. 2000), (Goodman and Darr 1998), assimilated as organizational memory (Stein and Zwass 1995), presented as a process of information systems planning (Huysman 1994), examined as a source of capabilities for system development (Andreu and Ciborra 1996) and business process outsourcing (Whitaker, Mithas et al. 2010) and used as a frame to study the role of IT in setting strategies to create learning organizations (King 2001). On the methodological level, Templeton, Lewis et al. (2002) have developed a measurement of the

organizational learning construct. The IS studies in organizational learning have been interested in testing the concept in different settings; where one of the most important is systems development contexts (Stein and Vandenbosch 1996), (Salaway 1987), (Lyytinen and Robey 1999) and more precisely in agile systems development (Lyytinen and Rose 2006). Other scholars focused attention on learning in distributed teams through technology aided systems (Goodman and Darr 1998); others on the impact of Enterprise Resource Planning systems on organizational knowledge (Baskerville, Pawlowski et al. 2000).

Argyris and Schön's model of organizational learning (1978)

Another interesting conceptual development of organizational learning is Argyris and Schön's (1978) drawn on a theory of action perspective.

The organizational learning theory suggests that organizational members respond to changes in their internal and external environment by detecting errors and correcting them to maintain the core organizational theories-in-use. The concept of theory of use is borrowed from the individual's theories of action that they hold and use to carry any situation and thus constituting a logic that they rely on in every situation. From an organizational point of view, these organizational theories-in-use or theories of action result from sharing of assumptions and cognitive maps among organizational members.

The construction and modification of these theories through individual and collective inquiry is what Argyris and Schön (1978) label organizational learning. Organizational learning occurs when individuals acting from their images and maps, detect a match or mismatch of outcomes to expectations which confirms or disconfirms organizational theory-in-use.

Argyris and Schön (1978) also distinguished two levels of organizational learning. Single-loop learning refers to the learning that organizations engage to fix the misfits in a way that keeps the present policies and routines to achieve present goals. Double-loop learning is different because it deals with the learning that organizations engage within a perspective of modifying the existing policies, norms and objectives.

In addition to the types of organizational learning, Argyris and Schön (1978) explained where learning can occur in organizations. They claim that the learning system is divided into two components: the structures of the organization and its behavioral environment.

Organizational learning system	
Structures	**Behavioral environement**
Communication channels Organizational space Procedures and routines Information systems	Interaction schemes Human qualities, feelings…

Table 27: Components of the organizational learning system. Adapted from Argyris and Schön (1987)

We adopt Argyris and Schőn's framework to assess the organizational learning process that the firm followed and thus by exploring the impact that adaptive actions have had on the different components of the learning system.

5.2.4. Social Cognition:

In doing so, we draw on social cognition theory. Indeed, organizational learning researchers agree on the necessity of considering cognitive aspects in studying organizational learning because it offers insights about how the process of learning develops. Generally known as referring to 'knowing', the term, adopted form social psychology, has been as well mobilized as referring to actions of data processing and interpreting. More specifically, regarding the relationship between organizational learning and cognition, Cook and Yanow (1993) reviewed research that dealt with this issue. They claimed that research on organizational learning was based on essentially two perspectives. While the first, acknowledge that organizational learning is the result of key individual's learning within the organization, the second postulates that organizations are able to learn because they are able to develop capabilities to learn, similar to individual capabilities to learn. These approaches relied on cognition-based and cognition-related concepts such as 'correcting mistakes', 'reflection' and so on.

In fact, the managerial cognition theory suggests that managers are assumed to be 'information workers (McCall and Kaplan 1985). Fundamental tasks of their work consist on absorbing, processing and disseminating information about issues, opportunities and problems. For example, Kiesler and Sproull (1982) suggested that '*a crucial component of organizational behavior in rapidly changing environment is problem sensing, the cognitive*

processes of noticing and constructing meaning about environmental changes so that organizations can take action"

In doing so, managers are called to develop capabilities to process the information used in decision making and problems solving. One way is employing knowledge structures which refer to a mental template that individuals impose on an information environment to give it form and meaning (Walsh and Fahey 1986). The stream of research on social cognition has its roots in the recognition of reality as a social construction through individuals' interpretations of experience, actions as well as their social negotiation of meaning (Berger and Luckmann 1967), (Weick 1979, Weick and Bougon 1986) as they cognitively build their knowledge about an information domain. Noteworthy is the fact that cognition, although occurring at an individual level, researchers have claimed that group-cognition and group-knowledge structures exist (Fiol 1994), (Gioia, Donnellon et al. 1989), (Walsh and Fahey 1986).

More specifically, frames or mental models are cognitive maps that individuals develop and rely on to make sense of their environment (Kiesler and Sproull, 1982) and interpret and understand various situations of their environment (Weick and Bougon, 1986). Indeed, individuals need to develop cognitive maps because they are unable to focus attention to and process all their environment data because their rationality is limited (Simon, 1955). Thus, they use cognitive shortcomings that are used as filters of environmental data. However, it occurs that the mental models in use become obsolete and inaccurate given the changes that te environment experience. In other works, the interpretation grids that individuals hold are no longer useful and efficient in making sense of the environment. In such situations, individuals adopt their mental models to minimize the mismatch.

In the literature, a link has been established between shifts in mental models and learning that is the process through which individuals alter and/or add to their existing frames hinges in learning and developing new understandings of the environment (Huber, 1991; Fiol and Lyles, 1985).

To investigate organizational changes, it can be very useful to consider socio-cognitive effects such as frames shifting (El Sawy and Pauchant 1988). In fact, researchers agree that studying frames shifts is more informative than studying the frames themselves through the examination of the role of managers' cognitive frames of reference in the processes of 'strategic issues diagnoses'. In fact, facing complex and high tempo environment,

organizations are in a constant search for opportunities and avoidance of threats and ills which include an important component of adaptation and consequently of environmental scanning to gather relevant information. Engaging either 'reactive scanning' defined by Simon and March (1966) as 'the search simulated by a problem and directed toward finding a solution; or 'proactive scanning' defined by Aguilar (1967) as a 'surveillance' action that aims to explore the environment, managers mobilize their frames of reference to make sense of their environment and interpret it as a part of their strategy formation.

In fact, organizations have been considered as interpretive systems because they can acquire the ability to process environmental changes and make sense of them as Daft and Weick (1984) argued '*Managers […] are in a need of processing the events and the information of their environment through the process of translating those events, developing models for understanding, bringing out meaning and assembling conceptual schemes among key managers*'.

To detect the signs of changes occurring with the organization's environment, managers rely on specific mechanism of focusing attention. Basically, the issues on which managers focus attention on represent subsets of the environment those mental models enhance more than others according to the specific internal and external context. Again, because the bounded attentional capability of humans prevent them from covering the whole range of environmental issues, managers adopt a selective choice of which aspects are to be attended and which ones are to ignored.

In technologies studies, the social cognition approach has been as well mobilized. One stream has studied how knowledge structures affect the interpretation of meaning, action and organizational outcomes, in particular settings as strategic decision making and organizational change (Bartunek 1984, Bartunek and Moch 1987), (Fiol 1994), (Kiesler and Sproull 1982), (Weick and Bougon 1986). A second stream questioned the place of cognition in products development processes (Dougherty 1992), (Walsh, Henderson et al. 1988). Has been also studied the influence of shared knowledge structures on a group developing an artifact and their understanding its properties and usages in social contexts (Bijker 1987, Bijker 1995). All the previous studies draw on the same assumption that is IT requirements, usages and goals are socially constructed through the interactions between individuals and artifacts.

One interesting application of the socio-cognitive perspective in the IS field is Orlikowski and Gash's (1994) '*Technology Frames of Reference*' or '*Technological Frames*' which

constitute ‘the subset of members’ organizational frames that concern the assumptions, expectations, and knowledge they use to understand technology in organizations’. Three frames that characterized technologists’ and users’ understanding and use of technologies were then identified: (1) the nature of the technology which refers to the understandings of its features and uses; (2) technology strategy which refers to the assumptions about management motivation for implementing technology and success/failure criteria and (3) technology in use which refers to the expectations about the priorities and resources, the trainings and the policies for security and quality.

5.3. Model and Propositions Development

This study investigates: 1) the link between the attention that key managers focus on technological changes occurring in their environment and the shifts in their technological frames; and 2) the impact of such shifts in the organization’s learning systems which we consider as an adaptive action. It adapts the model proposed by Barr, Stimpert et al. (1992) to the information systems field by 1) specifying the type of frames of reference by focusing only on technological frames or the subset that handles technologies; 2) replacing their dependent variable (organizational renewal) by the organizational learning system in order to assess how adopting a new technology that matches more the environment impact the learning system of the organization.

Our framework suggests that managers’ mental models, when inaccurate with the environment, get updated, enriched or removed, a process in which they rely of attention as a filter for issues that should be considered.

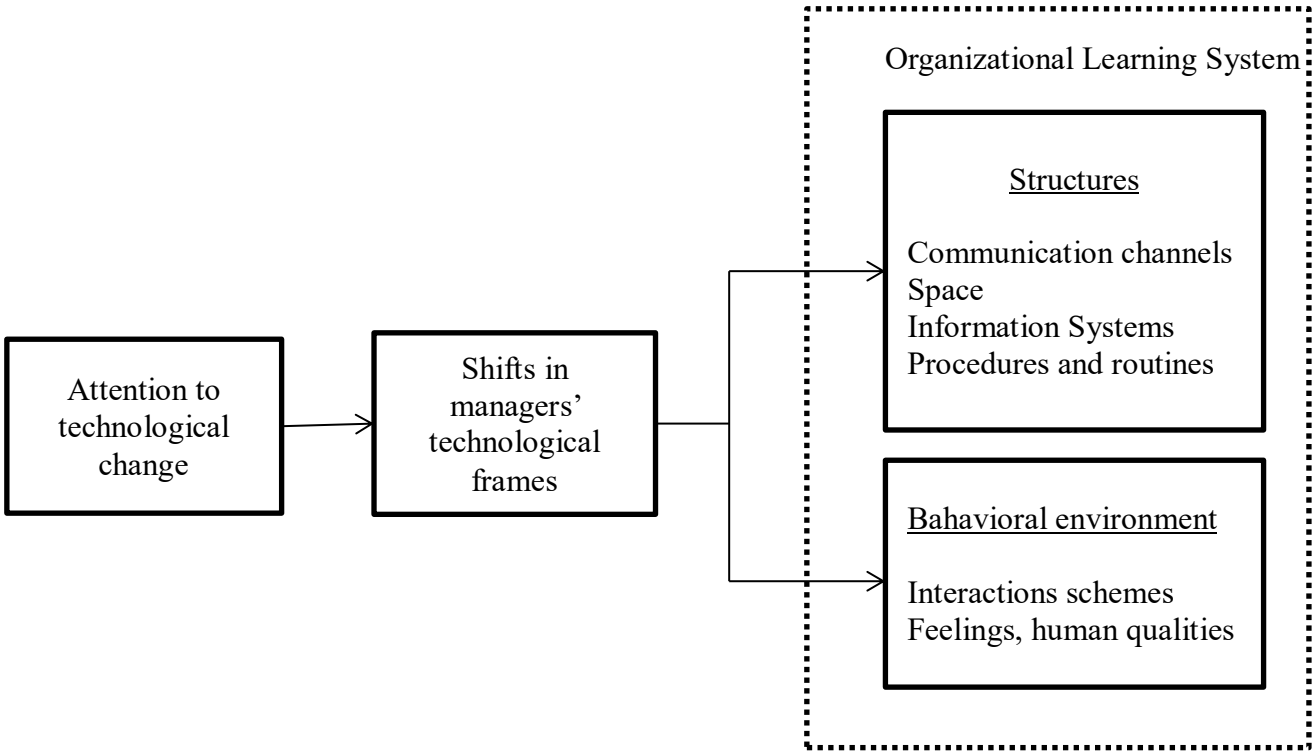


Figure 5: Model (Study 3). Adapted from Barr, Stimpert and Huff, 1992

Effect of technological frames shifts on the learning system

As detailed, the learning system of organizations is composed of two parts: the structures of the organization and its behavioral environment. By structures are meant all the setting that help individuals fulfill tasks, develop strategies and achieve goals. More specifically, according to Argyris and Shon (1978), structures refer to 1) the communication channels: either formal or informal, the means of communication with the organization constitutes one of its structures; 2) information systems: all the media and technologies in use within the organization; 3) the spatial environment; 4) the procedures and routines that guide individual behavior; 5) the system of incentives that trigger and enhance the inquiring/ learning minds. We claim that the shifts in managers' technological frames leading to decisions about adopting new technologies would affect the set of structures that Argyris and Shon (1978)

proposed. In fact, as we consider organizational learning as 'the experiential production and reproduction of organizational rules, leading to behavioral stability or behavioral change, we claim that the adaptive changes in technological frames that managers engage towards the environment's technological changes, would have an impact of the structural component of the learning system.

> *Proposition 1.a: Shifts in managers' technological frames would affect the structures dimension of the learning system*

Similarly, the behavioral environment of the organization, as a part of its learning system would be impacted by the shifts of managers' technological frames. In fact, the behavioral environment qualifies the work atmosphere of the organization especially the existing interaction schemes between its members and the human feelings they hold.

> *Proposition 1.b: Shifts in managers' technological frames would affect the behavioral environment dimension of the learning system*

Effect of attention to environmental change on managers' technological frames

Given that technology constitutes a core element in organizations and organizational development, a paramount part of managers' frames of reference' therefore concern technology. According to Bijker (1987), managers' frames of references about technology include three crucial components that they rely on to build judgment that are: the technology's objectives, the technology key problems and the users' practices. Differently, Orlikowski and Gash (1994) present technological frames as involving the nature of the technology, the structure of the technology and the usage of the technology.

In fact, the fast paced change that is evolved within the technological sector, managers happen to be continuous quest for novelty associated with their understandings and expectations of either new technologies or updates of old ones. Nowadays technological environment is characterized by an increasing novelty in technologies designed to help improve organizational performance. Social media represents one of the new technologies designed to improve organizational communication as it offers a larger scope of functions compared to old computer mediated communication tools. The benefits of organizational social media, more specifically ESN have been exposed in several studies and reports where the emphasis has been put on how ESN, traditionally used in private life, could be an appropriate tool of

organizations. As this issue has been gaining an increasing importance, managers have been focusing attention to it.

Ocasio (1997) grounded his seminal work about an attention-based view of organization on the premise that '*the cognition and action of individual are not predictable from the knowledge of individual characteristics but are derived from the specific organizational context and situations that individual decision-makers find themselves in'*. It consists in noticing, making-sense, interpreting and encoding the signs emerging from the environment such as the opportunities and threats. Accordingly, ESN tools have been interpreted especially within the technological sector as promising tools and thus gained managers' attention.

Indeed, the attention focused on ESNs results in not only making sense of the opportunities that the technology presents but also compare it to existing ones in terms of nature, strategy and usage.

> *Proposition three: Given substantial changes in the technological environment, managers particularly pay attention to ESN resulting in changing their technological frames*

5.4. Methodology

> *Under critical realism, a causal explanation for a given phenomenon is inferred by explicitly identifying the means by which structural entities and contextual conditions interact to generate a given set of events.* (Wynn and Williams, 2012, p.787)

To answer our research questions, we opted for an interpretive case study framed by critical realism . Following such an approach is considered as the primary research design under the critical realism paradigm (Wynn and Williams, 2012). Indeed, it enables IS researchers to develop in-depth causal explanations of the outcomes of a specific socio-technical phenomenon with a focus on the interplay of social, organizational, environmental factors with information technology and the role they play in the occurrence of phenomena. Markus and Silver (2008) as well advocate the use of the critical realism paradigm to search insight about and test the role of IT use.

Slightly different from the positivist tradition precisely that of Yin (1984, 2003; Dubé and Paré 2003; Eisenhardt 1989), and the interpretivist tradition (Walsham, 1995, 2006) which both aim at answering 'how' and 'why' questions, the critical realism perspective of conducting case studies is concerned with seeking 'what caused the events associated with the phenomenon that occurred' (Easton, 2010). Although this nuance in meaning originated in the central focus of critical realism on explaining causality rather than prediction, the main objective of researchers still focuses on understanding the 'how' and 'why' of the mechanisms behind the phenomenon emergence.

5.4.1. Sample Selection

Alpha is an international information technology services company. It accounts for a 2013 annual revenue of 8.6 billion involving 76.300 employees across 52 countries. Alpha serves as a global client base through the delivery of IT services via Consulting & Systems Integration, Managed Operations and transactional services. It works as global player in the payments services industry. Given its sophisticated expertise and industry knowledge, it spans its operations with clients across various business sectors including manufacturing, retail and transportations, public service and health, media and utilities…

Since 2011, Alpha set out a step towards leading the flow of organizational engagement of solutions so as to minimize the drawbacks of the phenomenon of information overload. The solution Alpha undertook is to act as a 'Zero Email' company by the year 2013. Alpha presented the program as' *the Zero Email program is a key pillar of the internal 'Well-being @ work' initiative. Its aim is to transform towards a social, collaborative enterprise where we share knowledge and find experts easily in order to respond to clients' needs quickly and efficiently, delivering tangible business results. First and foremost this requires a cultural change, learning new behaviors and management styles*'.

As stated in the Ascent White Paper (a series of papers that alpha's scientific community produces about emerging trends) about the phenomenon of information overload, the scientific community expounds the key incentive behind launching the Zero Email program. Defined as 'the brain inability to filter information presented to it, it has the potential to send the brain from a state of active engagement to passive disengagement through passive consumption of information; information overload constituted one issue that Alpha's managers focused attention on. In the context of corporate social network, however, much of

its potential drawbacks can be avoided. The decision of launching the Zero Email program was taken by Alpha's CEO.

> '"*We are producing data on a massive scale that is fast polluting our working environment and also encroaching into our personal lives. At Alpha, we are taking action now to reverse this trend, just as organizations took measures to reduce environmental pollution after the industrial revolution. Our ambition is to be a 'zero email' company within three years."* Alpha's CEO, February, 7th, 2011.

Alpha's experts further claim that 'Inbox overload' or 'Email overload' comes from ineffective habits and routines that need to be changed so that employees will be able to use more appropriate tools for task management rather than automatically turning to emails which increase low-productivity time. It is noteworthy that the program is mainly focused on internal emails within the enterprise. Employees may still need to use emails to communicate with customers and suppliers but in a way dissimilar to that used previously. Furthermore, the program suggests a series of training modules helping the introduction of more appropriate work place email behavior central to the way email messages are created as well as to the way incoming emails are both filtered and managed. Indeed, the Zero Email program is part of a more general program called 'Well-being at work', a program of global transformation that has been developing, since 2010, initiatives, approaches and activities to encourage new ways of working, intensively using innovative technologies.

The place of theory

A fundamental question for any researcher, regardless of philosophical stance, concerns the role of theory in their research (Walsham, 1995). For instance, Eisenhardt (1989) deals with this issue in perspective of organizational research along with an identification of three definite uses of theory. Such a distinction is stated in initial guide to design and data collection, as a part of an iterative process of data collection and analysis and as a final product of the research. Drawn from Walsham (1995), the use of theory allows for the building and design of a framework. We mobilized theories of organizational change, organizational and managerial cognition and organizational learning across both phases of the research. In earlier stages of the research, we used theory to create an initial theoretical framework which takes account of previous knowledge and which creates a sensible theoretical basis to inform the topic and approach of the early empirical work (Walsham, 1993 drawing on Pettigrew). To avoid using theory in its rigorous form common for covering up new issues and opportunities for further scrutiny, we followed an iterative process of data

collection and analysis with initial theory being expanded, revised or abandoned (Orlikowski, 1993).

5.4.2. Data Collection

Drawing on Walsham's distinction between an 'outside researcher' and an 'involved researcher', we followed the neutral observer path which offers more disengagement in the examination of the situation. This has been undertaken after requesting an interview with the Zero Email Program director and introduction of the frame and purpose of the study. The director did respond to the interview request and served as responsible for spreading the information among the program group members across the organization. He then launched a survey for people willing to participate. Interviews were then conducted with the program's members. For the second round of interviews, we followed a snowball sampling strategy. In that, every interviewee was asked to potentially communicate names of people who would likely be interested in the study. This has been crowned with 10 conducted interviews.

Data was collected during May and June 2014. They lasted in average 1h15. Some interviews were conducted in Alpha's Headquarters, other were conducted via Skype with the Zero Email program members in other countries than France.

As the choice pertaining to data collection, we used semi-constructed interviews; one of the most important data gathering techniques for qualitative researchers in business and management (Myers, 2009). Our choice for the semi-structured interviews is justified by the abundance of data that can be collected for interviews analogous to the richness of the studied phenomenon.

We expose in the following table 26, our data collection protocol.

Dimensions	Purpose / Example of question
Environment/ industry's characteristics	Understand the underpinnings behind launching the Zero Email program. Investigate whether it constitutes a response to internal or external (or both) change requirements.

	• *How can you describe the context of firms specialized in information technologies? What characterizes the most this sector compared to other sectors?* • *What major changes/ miles stones/ waves has the sector known and still knows?* • *What are the criteria of success? Are they changing over time?*
Attention to change	Understand the mechanisms the organization used to focus attention on specific environmental signs and interpreting them as requiring change/adaptive response. • *In the documents on Alpha's website, I can find words and expressions like, social collaboration, social organization, new workforces, a better way of working…why does it focus on these issues rather than others?*
Shifts in Managers' technological frames	Assess the 'before' and 'after' the Zero Email program (regarding technologies and IT-related strategies) • *What was wrong with the old way of working ?* • *Any new focuses on setting strategies?* • *What the new place of technology? (Comparison between the Email and the ESN)*
Changes in the organizational learning system	Focus on the evolutions/changes that the components of the learning system have known after launching the Zero Email program and implementing the new information systems. • *What is the program supposed to change?* *- On the human level* *- On the managerial level.* • *What is the philosophy of the program?* *(and going through all the components of the learning system one by one to assess how things changed)*

Table 28: Protocol of Data Collection.

Besides the interviews, we undertook the analysis of the different available documents that Alpha published online in the introduction of the program. Such documents include two annual reports dated 2012 and 2013, digital brochures as well as Ascent White Papers.

5.4.3. Data Analysis

Our analysis was conducted following three main phases. First, we proceeded with the content analysis of the interviews; then we develop a response to each exiting theoretical proposition of ours.

The first step of our analysis consisted in reading the transcribed interviews several times along with the documents that we collected. Data was confronted to several theoretical lenses during analysis. To this end, we used NVivo 10.

While answering the third proposition was undertook through an emergent way, data regarding the other proposition (1.a, 1.b and 2) were investigated though 1) the organizational learning system concept of Argyris and Schon (1978) and technological frames cadre, more specifically mobilizing two frames: Bijker's and Orlikowski and Gash's (1994).

To answer the first proposition, we coded the relevant data with an emergent coding scheme. The most recurrent information was gathered and labeled. We began by coding the answers to the environment and industry's characteristics set of questions. Categories of characteristics has then emerged and been classified. Then we coded data concerning the attention that Alpha has paid to specific environmental issues and how they were interpreted as requiring a deep organizational change.

To analyze the shifts in managers' technological frames, two theoretical conceptualizations were used to essentially assess the evolutions and the changes that the way of working has known compared to before launching the Zero Email program: Bijker's frame and Orlikowski and Gash's (1994). Both are used to investigate the technological dimension of the studied organizational change as we use them to compare 'old' technologies and 'Zero-Program's new ones'

Bijker's framework was mobilized to assess the objectives, the key problems and users' practices and Orlikowski and Gash's was used to give insights about the nature/structure of the technology, the strategy of the technology and the technology in use. Combined, the frameworks offer a rich view of the how the managers' technological frames have shifted with a focus on the role and the place of technology in this process.

Finally, to analyze the changes that the organizational learning system has known, we relied on Argyris and Schon's framework. We developed a coding scheme involving the different

components of the organization's learning system in order to map out the changes that occurred during the transformation process.

5.5. Results

We divided our model for analysis into three parts; the first is about attention and interpretation of environmental technological changes; the second covers the shifts in managers' technological frames while the third explores the question of organizational learning and adaptation.

Attention to and interpretation of environmental technological changes

Factors that triggered Alpha's attention

What collected data revealed about the relationships that we propose to test in the first bloc of our model, can be addressed in three levels: the first level involves the facts and phenomenon that have triggered the organization's attention. These are part of the organization's environment. The second level is what made the attention being focused on such dimensions of the environment. The third level pertains to the kind of interpretation that has been made of these phenomena.

Indeed, when raising questions asked about the environmental triggers behind setting the Zero Email program, three factors were identified that are 1) the characteristics of the information technologies sector within which Alpha operates; 2) the increasing number of studies about the irrelevancy of the Email technology; 3) the awareness about other environmental shifts including the new modes of life.

As for the first is about what characterizes the sector of information technologies. Within this factor, two main characteristics are then underscored: the continuous change and the rude competition which are positively correlated.

> *I think that if we don't change, we will disappear especially in this industry. We have to continuously change. Like all the other companies in the 'Information technology' industry, Alpha is searching for something that distinguishes it from competitors that's why we continuously put ourselves in question and ask what's next to be done and what would be the best way to do it. I think that we are in 'daily change' basis. It is very important to evaluate our processes, our tools, our resources. (Jean-François)*

Competition is very tough because there are a great number of actors. You know what makes the difference between you and your competitors in this industry? it is the fact that you heavily rely on your human factor to be innovative and to create your competitive advantage.(Anne-Catherine)

Allied to these two characteristics that best describe the information technologies sector is innovative spirit of the firm. Firms rely heavily on such a characteristic as it is fundamental for competitive advantage and accounts for a major basis and quality in their business towards fostering quality level productivity. Innovative spirit can be developed around different dimensions applied to the organization's information systems by innovating and cultivating innovative talent on the level of technology itself through developing its technical characteristics as to the level of processes (here the way technology is used). Firms hold to continuous quest for developing competitive applicable technologies with the most performant systems around.

Our sector is very innovative. I think that what distinguishes as from other industries is that we are obliged to change and to be up-to-date in technologies (Jean-François)

The second environmental sign that seems to have triggered Alpha's attention lies in the reconsideration of the human factor within business and more specifically within information technologies sector. Organizations, recently, assess that while they were continuously searching for higher performance, have so far neglected the place of humans. Interviewees explained that issues such as the well-being at work and the human based performance are gaining significant importance.

Organizations have turned to a new mode of leadership. We were focused on the productivity, the performance and growth. Yer human elements are a bit lost. Today, we are as well focused on the human. It is an extremely important issue. We still seek growth and productivity but for that there are humans not machines who need to feel good to work. (Sylvie)

Today, I think that the sector is in a phase of standardization, at least in France. It is an ongoing industrialization. The actual evolution is the same as the other industries have known. We are regaining consciousness that the productive force is human. The human has totally been substituted by machines and has himself become a machine. So he is treated as a machine. (Jean-François)

A third factor that has been assessed by interviewees is the increasing number of studies focusing not only on the limitations of the impact of some technologies overuse like Email on the performance and productivity as well as the dark side of over-investing in technologies

associated with negative effects on the well-being of employees and their attachment to their company.

> *It is not only in Alpha. It is all over the world. There are many studies on this which showed that only 20% of the information that a manager receives have an added value while 80% don't. The ideas of reducing this to the minimum, ensuring that the information is well exchanged and brings value and that people are able to act and interact are central in this approach* (Elias)

In addition to the various factors that have been assessed by the interviewees and which concern essentially the sector of information technology business; one factor that goes the business cycle has as well been proven: the new modes of life. By mode of life, we refer to the specific features that employees who were born to new generations perceive work and the corporate relationship between professional and private spheres. New modes of life imply the new definite forms of social relationships supported by social media and the accessibility of information. In fact, the employees of the 21st century who are fully engaged in what they receive and produce seen to be more than ever digitally connected and turn to digital nomads.

It is quite worth noting that, when asked whether lancing the program constituted a response to a dysfunction in the company's processes, interviewees expressed that this would be a reductive way of assessing facts. The triggers of this change reside in the general context within which Alpha operates.

> *I don't think that it is a matter of dysfunction that triggered this decision. I would say it is rather an environmental pressure, a global change in the way of thinking. All the notions of durability, ecology and sustainable development triggered this regaining of consciousness rather than the dysfunction.* (Elias)

> *What I want to say is that we have, of a sort, lost the notion of importance and of what has to be treated immediately. With the huge flows of information, we have lost the notion of priority and the notion of importance.* (Jean-François)

Attention mechanisms

Institutionalized attention/ watch

Opening up new venues for transformation, Alpha has so far institutionalized two communities towards enhancing the role of thinking and anticipating unexpectedly upcoming technology disruptions. This has been implemented with a view of setting Alpha's future strategies. The first institutionalized community is the 'scientific community' that was

launched by Alpha's CEO including 110 members from all the 52 countries where Alpha operates and delivers its services. Through the 'Ascent White Papers' that it publishes, the scientific community intends to create the change by pointing out the future trends and challenges.

> *We have a scientific community where members study trends for the 3 to 6 next years. 5 years ago, they identified the need for more and better collaboration. Also, to reduce the 'noise' of information received in emails every day. The idea came from there. Encourage collaboration and reduce the one-to-one exchanges that would be lost over time.* (Elias)

The second institutionalized community is 'the Young Talented', a community which has been formed when brainstorming about the change that Alpha has to establish. The appeal to this community is justified by the focus on its members' age. Representing the youngest profile among collaborators, they were asked about how they imagine the future of work and professional engagement and what would be their preferences in terms of modes of leadership, social exchange and space of work.

> *Then, we had this very uncommon reflection by people who volunteered to participate and who were willing to share their ideas about' what would be our new way of work? How do we imagine our work in the future?* (Jean-Charles)

The leader's role

On the other hand, besides both the scientific community and the young talents community which are institutionalized, attention focus of Alpha on these special issues has roots in the CEO profile. CEO and chairman of Alpha since 2008, also held the position of the ECO and chairman of Thomson (1997-2002), again chairman and CEO of France Telecoms (2002-2005), T. B served as France minister of Economy, Finance and Industry (2005-2007) before joining Harvard University where he taught 'leadership and Corporate Accountability'.

As interviewees stated, the CEO of Alpha is perceived as a very charismatic person with a highly innovative spirit. While the premises of Zero Email program were set by the scientific community through its Ascent White papers about the drawbacks of email and information overloads on employees' productivity and well-being, the communication of the program was insured by the CEO

I would say that the CEO is really up-to-date. He really brought strong drive and initiated change. I think that he is very inspired by what he sees around him. He is very attentive to what is happening around the organization and he is very innovative with the willingness to bring meaningful changes. (Sylvie)

The decision was taken by Thierry Breton (the CEO) who was really in an approach of transforming the enterprise. There are as well other elements of transformation as decompartmenlizing the enterprise and to giving to everyone the possibility to make a better contribution to the whole enterprise. This is the foundation of this transformation. (Hélène)

Noteworthy is the reputation of Alpha' CEO in the press.. Known as cost-killer leader, CEO initiated, while then CEO of a major Telecom Company between 2002 and 2005, the TOP program for 'Total Operating Performance' in order to reduce the company's costs which counted 70 billion euros at the time essentially through radically changing the way of work of the employees who proved, as T.B estimated, not enough productive. Having known a wave of serious social and well-being issues between 2008 and 2009, when a second program, led by the successor of T.B, aiming to further reduce costs though removing 22000 posts and changing 10000 functions, the Telecom company since then has kept the connotation of a system focused more on boosting productivity and reducing costs rather than the employees' well-being. The name of Alpha's CEO, even not proven directly responsible of what happened in the Telecom Company, is still associated to the affair. We can thus imagine a correlation between what happened then and the strategy of T.B to pay more attention to what the results of deep transformations programs would be.

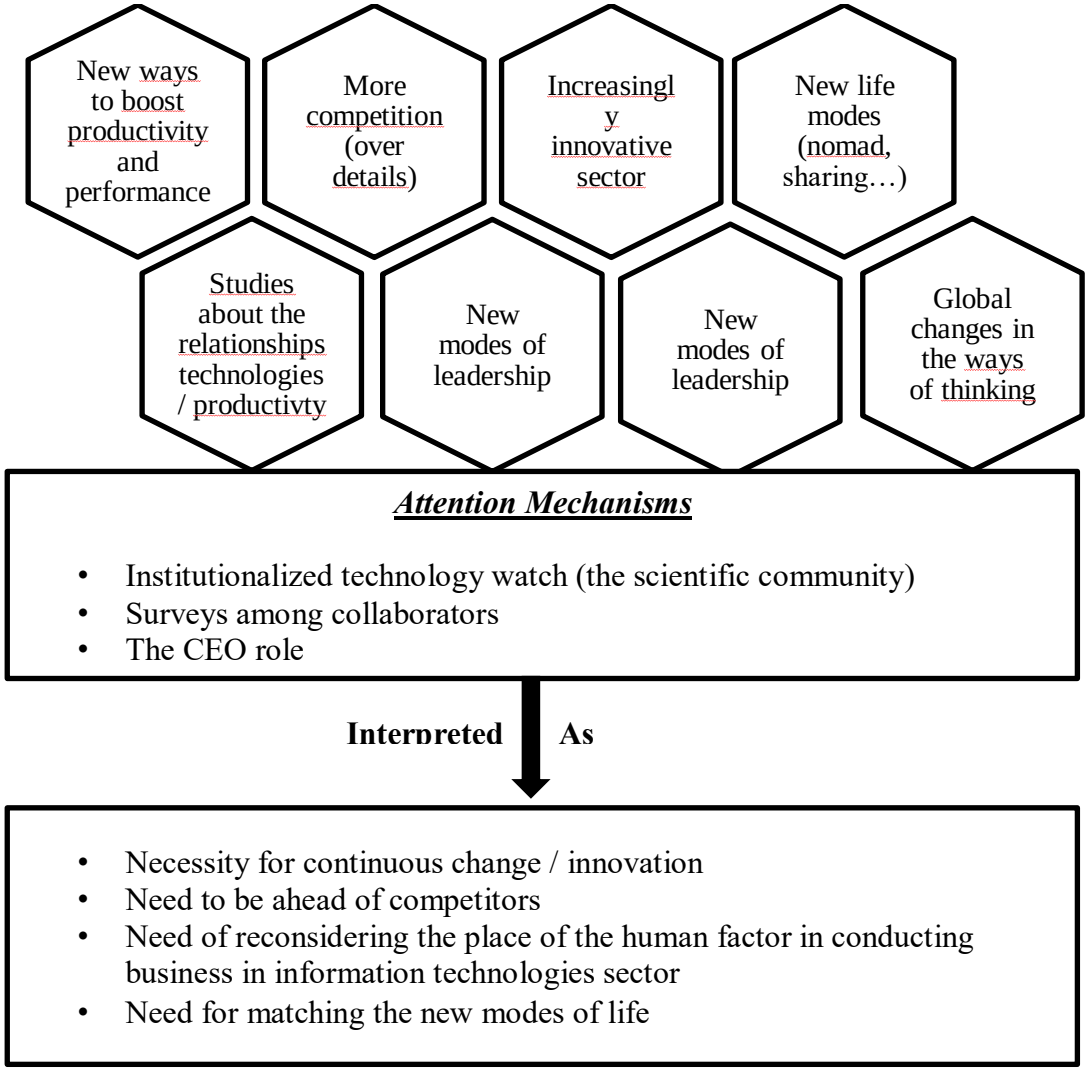


Figure 6: characteristics of Alpha's environment/ Reasons of change

Changes in managers' technological frames (based on a combination of Bijker (1987) and Orlikowski and Gash (1994)

In the present section, we mobilize two frameworks that are Bijker's (1987) and Orlikowski and Gash's (1994) because we consider that combining them is more relevant in our specific case Indeed, as we aim to draw how alpha's managers' technological frames shifted resulting from the interpretation of environmental signs as requiring change, we focus on how alpha's managers made sense of these requirements in terms of technologies. We thus point out how they perceived the old technology and the new one through the two frameworks.

While Bijker's concept of technological frames (1987), though not called such, represents three elements embodied in the objectives, the key problems and the users' practices; Orlikowski and Gash's concept of technological frames is constituted of three dimensions: the nature of the technology, the strategy of the technology and the technology in use. We consider the two frameworks as complementary because they enable us to point out the problems associated with the old technology and the strategy of implementation of the new one especially that our field study has been undertaken during the first steps of implementation of the ESN.

Bijker's framework (1987)

Regarding the old tool (Electronic mails)

Objectives

Regarding to the old tool, namely the email, the objectives were not detailed by the interviews. Two objectives were cited in large: communicating and coordinating. This could be explained by the sheer fact that the email, in todays' organizations, seems to be drained of its meaningfulness. As a tool that has continuously been used for more than 30 years now, its initial objectives, though themselves lacking precision from inception, seem to be forgotten. While the novelty that the email presented when firstly introduced in organizations, lay most in the rapidity and traceability of messaging essence of using emails, many patterns of usages and practices have so far emerged. The email is now used for various objectives in several different ways which, as it is happening, constitute the major arguments for our participants when assessing the key problems. Even more, the email is not only rendered void of its meaning but has also become a source of stress and work interruptions and disruption for its users.

Key problems

More precisely, in the course of examining email's key problems, our assessment has attained two essential levels: performance-related problems and human-related problems. While the performance-related problems pertain to the productivity and efficiency of the employees using the email to communicate and coordinate, the human-related problems is associated with the emails users' well-being and satisfaction.

On the first level, the key problem is that email is used to communicate all kinds of information without any filter, which results in email overload and, therefore, information

overload leading to the emergence of inbox management related issues that negatively affect the productivity. The second level is related to the problems that email causes to humans. The main issues are the continuous interruptions that Email users experience and which negatively affect the work environment characterized by continuous stress and frustration. Issues of trust and responsibility are also show up because Email can be used to go through tracing and tracking's people exchanges and sharing. Further important is that email substitutes for human exchanges or other media exchange.

> *The inbox is the repository of many very different topics coming in a random order and that are very different in terms of importance and urgency. You can receive emails that you think about for a period of 2 or 3 hours in a very methodically way. Others are associated with applications' notifications which are of great number in large organizations as 'You asked for a day-off, your request is accepted'.* (Anne-Catherine)

Users' practices

As for Email users' practices, the interview participants underscored three problematic features of practices. First, email users tend to use it for fulfilling various tasks. Going beyond basic communication of direct task-related messaging, the email is also used to plan meetings and/or exchange news and jokes. Second, Email users seek beyond such communication. It becomes important for employees to build images of themselves when using emails. For instance, people who always reply to emails promptly might seek to communicate an image of them as always connected, very reactive and more productive than others. For that purpose, they tend to make overuse of the CC and BCC functions in order to communicate the message to a large number of staff in the organization seeking recognition or manage conflict and conflictual relationships or address power-related issues. Third, email users tend to substitute for all the communication means by email. Several interviewees revealed employees exchanging emails through occupying the same office.

> *L'email était utilisé pour tout faire, on voulait aussi rappeler le pourquoi de l'email et ne l'utiliser que pour la raison pour laquelle il a été fait. C'est d'envoyer des choses de one to one et non dans un but de collaboration. Maintenant, on constate que l'email est même utilisé pour la gestion des tickets, et dans plein d'autres sujets.* (Anne-Catherine)

The following table 29 summarizes the insights that our data revealed about the Email's objectives, key problems and practices.

Email		
Objectives	**Key problems**	**Users' practices**
Communicate Coordinate	1. A depository of all kinds of emails → Inbox management issues 2. Email Overload 3. Information Overload 5. Absence of human exchange 6. Only 20% of the exchanged information via emails were of a value (internal survey of Alpha) 7. Stressful, frustrating and counter-productive tool. 8. Trust and responsibility (tracing) problems	1. Use emails to do every kind of tasks. 2. Substitute direct interaction and /or other communication channels with emails. 3. The majority of collaborators spend between 2 and 3 hours/day in managing their inboxes (answering, filtering, deleting, classing…) 4. CC and BCC issues

Table 29: Emails' objectives, key problems and users' practices

Regarding the new tool (the ESN)

In the following section pertaining to the new tool, two grids of analysis will be carried out. In the first instance, we apply Bijker's framework (1987). The second is Orlikowski and Gash's framework (1994). We opted for applying only Bijker's framework to the old tool (the Email) but both frameworks to the new tools (the ESN). This choice is grounded on several reasons. First one fully aware that the decision of implementing the new tool comes as a reaction to the problems that collaborator comes across while dealing with the old tool which asserts the 'key problems' dimension of Bijker's framework. The dimension of 'technology usage' is more prominent in the old organizational setting where the email is used rather than in the new setting where the ESN is applied; because in the first case, there is a background of use where patterns of usage as well as practices of users can be considered and assessed. The users' practices and patterns of usage of the ESN remain at the stage of conducting our study theoretical assumptions.

The tool

> *A social network which structures different collectives called communities with well-defined goals. People can thus work together where everyone is supposed to liberally*

contribute to create value. The collaborative tool is supposed to constitute collectives that themselves represent the first germs of value elements. We then work on them to create real value through them. (Jean-Charles)

As for business processes, we identified 9 processes families in Alpha as finance, HR, legal and others. We then built subsets of processes so the managers can tell which processes are the most correlated with email use. The question was if it is convenient to dissociate the process from the email. (Vincent)

Objectives

Behind investing in the ESN as a substitute for the Email, executives set many objectives. The first most general stated goal aimed at deeply transforming the organization through the establishment of socio-collaborative work environment. This actually resulted from assessment of the limits of using Emails. Executives looked beyond Email for a way to reinvent the communication practices within Alpha.

It is not the simple substitution of the email by a new collaborative tool but a new way of thinking work. (Hans)

People often think that Zero Email Program is for removing emails. That's not true! The idea is that we encourage exchanges, reduce time spent on one email, make sure that people are responsible for information they share and actions they take as they collaborate. If we do this right, we will find ourselves with fewer exchanges emails. (Vincent)

It is a program that aims at deeply transforming how the enterprise works through socio-collaborative practices. Today, value creation is done rather collectively than individually where a good group of people may produce more value. We now recognize that value creation should be done through maximizing the interaction between the enterprise and its external environment but also enlarging the internal interaction. (Anne-Catherine)

Second, Alpha has been in a need for the integration of the smaller business it has been acquiring. It developed it business in different regions across 52 countries by acquiring smaller business and other companies. On a demographic level, Alpha's employees are from different countries with diverse cultural backgrounds and diverse corporate cultures which urge the creation, according the Alpha's executives, of a continuous need to integrate new recruit. It was assessed that a social collaborative way of working would both facilitate the integration, enhance the collaboration and ensure an environment fit for a better productivity.

Alpha is the result of many mergers and acquisition. We have doubled the number of emloyees. We were 40000 at the beginning. Now we are 80000 employees. We have

always been confronted with integartion issues : human and system itegration. The Zero Email program aims to facilitate the integration and to enable access to all the depository of skills and netwroks. (Anne –Catherine)

Another stated objective of Alpha lies in the direct objective of implementation of ESN to reduce information overload.

It is the implementation of a socio-collaborative tool with reducing the informational overload as one of the biggest motivations. We wanted as well to change the practices related to the use of emails. (Sylvie)

It is not that simple. I would say that it is an overall change of behaviors. Information overload is one of the fundamental elements but another important element is the fact that information today is continuous and we are information-addict. We are ourselves actors of the information overload. It is the same behavior that we have when a phone rings. While there is a system to leave a message, people call but don't leave a message. This does mean that they didn't have anything urgent to say. We behave differently from this logic, when a phone rings we hang up. We do the same with information. We accept to be disturbed while there is no reason to. (Anne-Catherine)

Key problems

This dimension is not available in the participants' responses. They only have assumptions and hypothesis about how work with the ESN should be.

Users' practices

The interview participants revealed they can't talk about the ESN users' practices because time is needed to assess this dimension of the program. They only talked about expectations and things to further encourage or rather to avoid. They talked about users, really enrolled in the general spirit of the program with a focus on the importance of sharing as a central driving force. They encouraged practice is using 'Email Etiquette' which basically refers to the classification of tasks from highly correlated to weekly correlated with the necessity of using Email (To what extent Email is the most appropriate tool to perform this task?). If the correlation is high (eg. Tasks where legal documents have to be shared), Email can still be used. In the opposite case, exchanges are no longer done via Email but via the ESN. The practice to avoid consists is using the ESN as a private social media network.

We absolutely didn't want to have an enterprise Facebook. We had to carefully organize the usage of the ESN. We thus build communities of different types and set key roles. We established work methodology for using the communities. If you implement it as an ordinary tool, an ordinary ESN, people will login in, communities will sport out like mushrooms and there will be the same community in double. Information will be completely lost and we won't get the performance we are looking for. (Sylvie)

The following table 230 summarizes the ESN objectives, key problems, key problems and users' practices.

The Enterprise Social Network		
Objectives	**Key problems**	**Users' practices**
Performance-related objectives: Reduce the information overload through establishing a social-collaborative environment Insist on individual contribution to the organization's knowledge Encourage the collective creation of value Human-related objectives: Integration of the acquired companies Emergence of new individual and managerial behaviors Establish trust and responsibility feelings	Not identified	Use Email Etiquettes Insist on socio-collaborative practices which focus on sharing. Avoid the facebook(sation) of the tool --> Expectations exceed the personal level of making contacts and sharing personal information to reach the effectiveness and value creation demands levels.

Table 30: The ESN objectives, key problems and users' practices

Orlikowski and Gash's framework (1994) regarding the ESN.

The second grid of managers' technological frames that we propose is Orlikowski and Gash's (1994). Their basic claim is that people's technological frames can be assessed through shifts in three dimensions.

The nature/structure of the ESN

The first dimension refers to the nature/structure of the technology where the 'physical' characteristics/ features and properties of the artifact. As far as our case is concerned, the technology, as previously presented is a social enterprise network tool. Developed by a start-up that has been acquired by Alpha, it is presented as a hub of the work-day of 'modern' employees. The features it presents are supposed to cover the totality of the tasks that nowadays employees are called to perform while working. The following table 29 summarizes the various features of the ESN.

The structure of the technology		
BlueKiwi (an Enterprise Social Network tool)	Newsfeeds	Keeping collaborators informed in real time of their community's members activities (posts, comments…). It is permanently updated.
	Communities	Creating a private or public space for a group, a service, a department or a project in order to facilitate information exchange
	Blogs	A virtual space of exchange. Collaborators are supposed to share information (related to work or not) in the form of blogs.
	Private and public messaging	A messaging feature
	Content Sharing	A deposit for content (other than short posts in the newsfeed)
	Administration Console	Features only available for the communities' leaders.
	Statistics	Provide statistics about collaborators (enrollment in communities, the frequency of use…)
	Security	Security parameters
	Mobility	The possibility to synchronize the tool with mobile devices
	Integration	Ensuring the compatibility and integration possibilities with the company's other information systems and technologies

Table 31: Overview of the features of the ESN

The strategy of the ESN

By strategy, Orlikowski and Gash (1994) invoked '*the people's views of why their organization acquired and implemented the technology; it includes their understandings of the motivation or vision behind the adoption decision and its likely value to the organization*' (Orlikowski and Gash, 1994, p.183).

In the context of our specific case, the overall strategy resides in the executive willingness to transform, make changes and recreate the company's style of work. Based on the fact that Alpha has grown by essentially acquiring smaller companies, and given that executives aimed at promoting the company's image as a perfect place to work and to be, the main objective/strategy behind implementing the tool was to create a socio-collaborative work environment where the value creation centers around concepts of Email usage rules, sharing, collaborating and promoting individual contribution towards business growth and human well-being. Accordingly, we were also interested in the implementation strategy from the initiating of the decision of investing in the new tool to the implementation per se because data have shown that the implementation was carefully thought over and aimed at giving the right sense about this transformation to employees. It is widely accepted that the implementation strategy reflects a dimension of the overall strategy because it gives insights into what strategy developers wanted to send as a message. In the following table 32 we detail the implementation strategy that Alpha's executives and Zero Email program group set.

The Strategy of the Technology	
Overall strategy	**Implementation strategy**
Transform the way of work to a social-collaborative style where performance results essentially from the collaboration between collaborators	2011: Internal survey 2012: Launching the program 1. Deciding about the tool. Acquisition of blue kiwi company 2. Identify the program director and 4 assistants to manage 4 issues: • business processes, • the ESN implementation, • the change management and communication, • the indicators follow-up 3. Structure the usage of the ESN (communities) 4. Launch the tool implementation and migration 5. Identify SPOCs (Single Points of contacts as ambassadors of the program) 6. Identify success stories

Table 32: the strategy of the ESN

Business Processes	The ESN implementation	Change Management	Indicators follow-up
* Divide them into micro-processes * Assess the necessity of emails in conducting the process through correlation indicators * Deliver zero email certificate to the processes and officers in chare who were willing to give up using emails. These certifcates constitued as well an appreciation for the officer in charge of the process. Example: The process of asking for days-off, the notifications of accepting or rejecting the request was certified zero email process. The officers in charge of it were certified zero email and were given a role in the chnage management process as they presented willingness and motivation toa dopt the new program.	*Identify the expected usages from the ESN. *Focus on specifying the usages of the ESN unlike the general thoughts about an ESN that can serve to do all and everything in the organization *Think about which tools can be used to insure the discussion/ messaging dimension as well as the archiving system *Opt for two tools. 'Link' for instant messaging and 'Sharepoint' as an archiving system *Exceptions were made for emails with legal character because posts in the ESN are not yet considered as a legal documents.*	*Set a strctured approach to conduct the change. *Mix the top-down and the bottom-up approaches to get the best results. *Set a sponsorhip strategy where 4 sponsors are identified: the CEO, General secretary of the group, the Human Resources Chief Officer and the Communication Chief Officer to ensure that other collaborators follow them as examples. IT manager and change management manager were as well part from the comity of sponsors * identify zero email leaders in the different geographic zones * Set a voluntireness system for the bottom-up approach. Motivated collaborators were asked to volunteer for 2 or more hours/week to help others understand and use the new tool with an emphasis on best practices. *Set up a new function: Community manager. For each geographic zone, each service line (business line), each market and each function, one community manager were designated.	This was considered as confidential information and we were not allowed to have an in-depth idea about the evaluation strategy that Alpha set up except some genral dimensions that were evaluated such as number of users, time spent of the ESN, number of posts and comments, period-trends...

Table 33: the ESN Implementation strategy

Adaptation as an organizational learning process (Argyris and Schon, 1996)

In this section, we propose to examine how the organizational learning system has been impacted by the organizational change that Alpha experienced through the transformation program that it implemented across the company. In doing so, we assess how each element of the organizational learning system has been influenced by the change. A previously stated, Argyris and Schőn proposed that the learning system of the organization is divided into two major components: the structures and the behavioral environment. We first intend to go through the elements that constitute the structures then further examine the effects of the change on the organization's behavioral environment.

One significantly central idea of the transformation program is building a 'Zero Email' company that conducts work in keeping with two major principles that are, 1) Email usage rules and 2) a collaborative eco-system. While the first principle concerns a change in the procedures and routines, the second principle concerns al the structural components of the organizational learning system.

Structures of the learning system

Communication and Collaboration Channels

With a view to ensuring communication, Alpha collaborators have used mainly Emails. The communication could take the form of one-to-one or one-to-many exchanges. What is different with the ESN is that the exchanges take place within the collaborative ESN's space. More precisely, the 'message' which is now called 'post', is posted by the sender (now called community member) on the dedicated space (the community). The answers to the post take the form of comments. Links to documents can also be uploaded in posts. Indeed, the ESN space is organized in the form of communities. A community is a space that is dedicated to one theme of exchange likely to be shared between certain collaborators.

> *A community is a business purpose, we don't mix different topics in the same community. We seek performance. If we want to have business benefits, we have to have a business purpose per community. This is the baseline of our ESN.* (Sylvie)

Each community has a community manager that accepts enrolments in the community and manages the exchanges within it. If one or many community members opt for an exchange with specific other members, the ESN offers the possibility to send private messages within the community. Alpha has implemented four types of communities.

Organizational Communities	**Project communities**	**Interest Communities**	**Expert Communities**
Each business line has its own community. Each geographical division has its own community.	Are dedicated for the project teams (sharing documents, shared agenda	Very general communities without a specified topic. (Well-being, innovation, news, holidays, sports…)	Ensure the direct exchange of information and expertise between the experts of certain technologies and software (SAP, Oracle) and the users (the employees)
Expected benefit: Sharing the strategic vision of the company	**Expected benefit:** Help new entrants, better visibility over the in-group exchanges and the project conducting progress	**Expected benefit:** Favor the collaboration and the feelings of belonging	**Expected benefit**: Better response to technical questions, shorter delays and mutual improvements of experts.

Table 34: Types of communities.

An additional type of community has also been established: the executives' community and concerns top managers where they share strategic information. This community is a highly secured community.

As for communication outside the community, the ESN provides the function of searching for the profile of the recipient and thus sending a private message. All Alpha's collaborators have profiles with their photos, full names, electronic address, position and names of the communities they are members. One collaborator san be a multi-community member. For example, a collaborator who works on a project with an expertise on a specific tool and interested in innovation in High Tech sector can be a member of his project community, the tool's experts' community as well as a member in the innovation interest community.

Information Systems

With regards to the information systems, Alpha implemented other tools besides the ESN tool aiming at providing collaborators with specific tools for each task they used to fulfill with Emails. To collaborate inside and/or outside the community, and for business purposes,

collaborators are encouraged to use the ESN. For direct chat (even for personal purposes), however, they are encouraged to use a tool called 'Link' which is an instant messaging tool. The specificity of this information system is that the content of exchanges is neither saved nor stored in servers as it is commonly the case with emails that contain informal exchanges.

The third tool that has been invested in by Alpha is 'SharePoint' as a knowledge management tool. The objective behind such a tool is to encourage collaborators to use it in fulfilling tasks with high degree of documents exchange. The tool offers the function of storing documents and producing reports of Alpha's activity.

Information Systems		
Bluekiwi	**Link**	**Sharepoint**
An Enterprise Social Network with a focus on collaboration.	A tool for instant messaging	A knowledge management tool

Table 35: Alpha's new information systems.

Organizational Space

The organizational change that Alpha experienced has had an influence on the organizational space. Indeed, the 'Zero Email' program constitutes part of a larger transformation program called '*Well Being @ Work'* that targets all the 'physical' working environment of Alpha. In this sense, a survey has been conducted to cover the 'Young Talented' community to communicate about how they imagine 'the best company to work in'. In light of the results of the survey, the proposed recommendations have been set up in the new buildings of Alpha. The recommendations concerned essentially the working space and the services.

> *The smart campus concept includes the flexibility in terms of space. We have three types of space: Open spaces, rooms for meetings/ working together for 2 or 3 people and individual places which we call TGV places because it reminds the place in the train. You have the velvet seat close to the window and the mini-table. You can quietly work without being bothered by other people working in the open space. We also have different services: hair dresser, concierge service, laundry, car wash…*(Vincent)

> *To build our smart campus, everything started from our community of 'Young Talented' inside the 'Well Being at work' program who, before moving to the campus, recommended 50 ideas that have been implemented.* (Anne-Catherine)

Procedures and Routines

Procedures and routines could join a previous discussion in this research paper about the new tool users' practices. Because our case study was conducted sometime after implementing the new tool, new routines cannot yet be assessed at large. Two reasons are worth considering. First, routines might not come out yet given the paramount importance of time in such circumstances. Second, the program responsible for routine tracing not yet detect big differences in the collaborators routines. This is due to the nature of adaptation that was not mandatory and thus assessing the development of patterns for new routines requires a considerable number of collaborators appropriating the new method of working.

> *Actually, we didn't predict which routines will be placed or take place. We were rather following an approach of self-appropriation through free trials with one strong motivation behind: to become collaborative. After all, we will become collaborative; there will surely routines that will take place. Today, there are behaviors that are not at all collaborative behaviors for example; order a decision without making people co-build/ create something is a behavior which is contradictory to collaborative approach.* (Hélène)

> *We aim to develop new models of work as for example the open source or developing communities where people work together to create something without necessarily empowering someone as we are used to do in the traditional approach of industry where we basically produced the product et tried to sell. Now we have people who collectively try to create something… So this is the very important phenomenon that we tried to launch and to enact in the functioning of our organization… we also launched an open data approach through the big data and social networks. I won't only put information for me; I will instead open it and share it in a way that it is beneficial for others so we can create value since the information is open.* (Charles)

Emerging Structures (Specific to our case)

Besides the structures that Argyris and Schon 1996 expounded, our data revealed other aspects and features that have changed along with the new program and which we can consider as structures: 1) the institutionalization of new functions and a new hierarchy, 2) the reward system and 3) the mode of leadership.

Institutionalization of new jobs / A new hierarchy

A further aspect of the change within Alpha consists of the institutionalization of a new function: the community manager. Each community has its own community manager who professionally manages the exchanges within it. To manage all communities, the function of

'Global Head of Collaboration' was launched. That implies rethinking the hierarchy of the organization. As collaboration is now considered as central to the functioning of Alpha, high hierarchical positions were thus set as part of the board of executives.

> *On the top we have the CEO and the sponsors and then we have the global community manager. Like for the change managers of the Zero Email program, we have a community manager for each country, for each service line, for each market and for each function. His role is essential. He does not animate the community. He is the administrator of the 'Référentiel'. He draws out dashboards for the activity of the communities under his responsibility.* (Hélène)

Reward Systems

The community manager sets up within each community the concept of 'Success Stories'. They represent a means to reward the collaborators that best embody the spirit of the new way of working. Collaborators who prone active in their community through sharing posts, commenting others' posts and nourishing a collaborative spirit inside the community are rewarded by being granted the opportunity to testify the good aspects of collaborative work through their own experience. Financial incentives are also designed to allow for more motivation and as a way to enhance productivity and engagement.

Change in the leadership Management

The leadership mode has been also affected. As executives wanted to set the example to other collaborators, they opted for changing their leadership mode turning from a vertical one to a collaborative style whereby direct interaction with executives is made possible via video-conferences and holding questions and answers sessions on Twitter.

The behavioral environment of the learning system

The organization's behavioral environment is composed of 1) the interactions schemes within the organization and 2) the human qualities and feelings that characterize the atmosphere of work. As for the interactions schemes, this has already been covered through presenting the functioning of the ESN, a tool that has been implemented to set a new scheme of interaction between the collaborators. We hence focus on the second dimension which concerns the human qualities and feelings. Noteworthy; we examine this dimension as one of the expectations of the management. Our data showed that two types of feelings were encouraged by the executives via the establishment of the new way of working; creating 1) feelings of belonging to the organization and 2) feelings of responsibility and trust.

Belonging Feelings

Feelings of belonging concern the collaborators self-perception is relation to their organization. Executives seek that the program, while focusing on promoting the individual contribution to the value creation of the organization within a socio-collaborative environment, enhances the collaborators' appreciation of their work environment and thus feel more commitment to the organization. This sense of belonging and the idea of organizing tasks per communities incarnate the same objective: enhancing feelings of categorization among collaborators where they easily identify themselves as members of communities which, in turn, inspire more dedication and value creation.

> *There will be a huge difference between the old way and the new way of working. I go back to this feeling of belonging to different communities through enlarging my work environment. It is no longer limited to a few people that I directly work with but includes other aspects of my work and I am able de bring value from different positions. This will completely change me, my perception to value creation in the organization.* (Elias)

> *We created four types of communities according to our global needs and our needs per GBE (country). The spirit behind creating these communities is to develop a sense of belonging among collaborators either they are members of the same organization, working with same client or interested in the same technology. In average one collaborator is member of 12 communities. He either contributes by creating value or gets value that other produced. Following this method of working made people work in an easier way and made them more dynamic.* (Sylvie)

Feelings of responsibility and Trust

The second type of feelings that executives wanted to promote are feelings of responsibility and trust. This can be aligned with the discussion previously held, on the key problems of the old tool (the Email). One of the key problems that email users confront, as Alpha's internal surveys demonstrated, is the lack of transparency, especially when it comes to the use of the Cc and Bcc functions. Collaborators have been shown to use these functions for other purposes than communicating; which created a context of lack of trust and doubt. Instead, with the ESN as a central means of interaction, exchanges are supposed to be transparent, which within the long term will result in enhancing the trust between collaborators. The feelings of responsibility, on the other hand, are associated with the feelings of collaborators

when contributing with something in the course of performing tasks (eg. A suggestion, an idea, a comment, a reassessment…). With Emails, collaborators tend to use the same function to reduce their degree of responsibility. If something goes wrong, the responsibility gets blurred between all the people informed by the content of the Email. This practice is no longer possible with the ESN where the contribution of a collaborator is signed with his profile and is transparent to all the community members. He is thus accountable and fully holds the responsibility of this contribution.

5.6. Discussion

The results of our case study provided evidence about all our propositions which confirms the course of actions that we proposed about how organizations detect environmental signs, interpret them and develop responses to them. Based on the proposed theoretical framework; we claimed that adaptive responses that an organization develops towards environmental change, result from a shift occurring in its cognitive system and may result in an organizational learning. More precisely, we proposed that organizations, when focus attention on the technological changes in their environment, proceed to their interpretation (as requiring adaptation, as significant or insignificant, as a threat, as an opportunity…). Changes thus occur on the level of the technological frames in use in the organization. The adaptive actions that the organization may engage in aim essentially at fitting the new technological frames, a process by which the organization learns. The innovative aspect of our study resides in the 1) Examining specific type of mental models, namely the technological frames because we are interested in a strategic technological change and 2) propose a processual relationship between concepts that are still being examined separately in organizational strategic change studies: they are managerial cognition and organizational learning.

With regard to our specific case, Alpha has experienced such a process. In fact, acting in an industry with very high velocity, very innovative spirit and a high human-added value, Alpha has recognized a continuous need for overlapping competitors and standing out from similar competing technology businesses such as a position that has been endorsed by institutionalized attention mechanisms that Alpha implemented to watch the sector and further, to detect the new trends and patterns for future potential actions. Given the characteristics of the sector and the new trends, supported themselves by Alpha's internal studies, the change has been interpreted as required. We have demonstrated how the adaptive transformation program that Alpha launched constituted a learning process given its effects on

the organizational learning system. We hence discuss our results through bringing focus on three points that we believe central to the understanding of the processual relationship between managerial cognition and organizational learning; 1) Attention to changes in the organization's environment, 2) the nature of learning and 3) the levels of learning.

Attention to changes in the organization's environment

So as to assess the attention mechanisms that Alpha applied in the quest to get its environment simplified and possible for interpretation, we grounded our assessment on Ocasio (1995) socially structured pattern of attention. The claim here was that the process of attention reflects a solid imbrication of the dimensions of the 'attention' concept. The focus of attention resides in the examination of the elements that provide guidance to decision makers in taking actions. Alpha's executives' decision of launching the transformation program is the outcome of their focus of attention on general issues of employees' wellbeing at work and on specific problematics of Email overload management. Engaging a rethinking of the value of the 'Email' technology, a general orientation about its obsolescence has then emerged.

The nature of organizational learning

As detailed in the literature review on the organizational learning concept, two main types of learning exist. Single-loop learning where mere adjustments are made to change behaviors in order to better fit the new requirements of the situation; is compared to double-loop learning which consists in the restructuration of individual understandings of the environment in a way that deeply alters the mental models of use to reach to new equilibrium along with resources fit the requirements of the situation. In our case, Alpha has initiated a profound organizational change aiming at replacing the old mechanisms of organizational communication with new ones that support the collaboration and the information sharing. Through the process of interpretation of environmental signs on the issues related to using emails to communicate in organizations as well as the new trends that corporate and private communication spheres know, Alpha has aimed to not simply to be affective against the drawbacks that email communication produce but to completely change the understanding of organizational communication while setting new mental schemes to make sense of the new frame. A frame that guides the organizational communication by positing a new rationale, as well as develop new perspectives of environmental requirements and new guidelines of behaviors. By profoundly affecting the organizational learning system, Alpha has and still experience a

double loop learning where the focus of attention is laid on the radical transformation of mental schemes in use and the initiation of new behaviors and routines.

Levels of learning

As Crossan and Berdrow (2003) proposed, organizational learning is a multi-level phenomenon that involves actions on different levels and interactions in between the levels of the organizations. Crossan and Berdrow developed processes and dynamics through which inputs of learning produce outcomes that serve as inputs of learning to higher levels. They argued, for instance, that the language that individuals use in conversations and dialogues which convey their cognitive maps need to be collectively interpreted so that they generate shared understandings and allow mutual adjustments within interactive systems; and phenomena that occur on the group level. In a similar fashion, for shared understandings and mutual adjustments to become routines and formalized procedures, the need for integration and institutionalization constitutes a condition. Equally important is the necessity of a feed forward and back of information throughout the levels of the organization in order for the learning to take place.

Level	Process	Inputs/outcomes
Individual	intuiting	experiences, images, metaphors
	Interpreting	language, cognitive map, conversation, dialogue
Group	Integrating	shared understandings, mutual adjustment, interactive systems
Organization	Institutionalizing	routines, diagnostic systems, rules and procedures

Table 36: Levels of learning. Adapted from Grossan and Berdrow, 2003

In the case of Alpha, and in the course of conducting our study, the project was in its second year of implementation and first year of effective on ground use by employees. The project team members have clearly revealed that it is seems early to observe how and whether new procedures of communication and routines are established. Although the main objective of the project is the institutionalization of a collaborative way of working, the shifts in employees'

technological frames are still in progress. According to Grossman and Berdrow's (2003) classification of processes enabling the organizational learning, the collaborators of Alpha are situated on the level of individually intuiting the experience of using the ESN and making sense of its rationale. Shared understandings still need to be established and effective behavioral adjustments still need to be engaged. For the organizational learning to occur, Alpha employees are called to appropriate the ESN in a way that new procedures of communication are adopted and thereby new routines established which constitutes the adaptation process.

Grounded on the fundamental definition of organizational learning as the experiential production and reproduction of organizational rules leading to behavioral stability or behavioral changes, two main points are worth developing.

First, it is important to note the dynamic nature of the organizational adaptation as a capability in the sense of (Teece and Pisano 1994, Teece, Pisano et al. 1997, Teece 2007), (Eisenhardt and Martin 2000), (Winter 2003). It is basically adding the resource-based view by building on the concept of organizational routines being the fundamental unit of analysis of organizational action and performance. However, routines occur on an individual level; while organizational adaptation, in our case, is a higher level construct. This joins a larger discussion about the origins of organizational capabilities raised by Felin and Foss (2005) about the extent to which collective organizational conceptualizations such as routines, culture and structures are grounded in the individual level; which makes their theoretical conceptualization not clear and their methodological application challenging. Appeals for explaining organizational phenomena through examining the micro-level are thus suggested through the process of micro-foundation view of organizational capabilities. Such a stream of research is gaining importance in strategic management. It constitutes an innovative lens through which micro-foundations frame the link between the renewal of IT-related routines and organizational adaptation to environmental technological events. This may constitute an interesting and innovative topic for our future research.

Second, again from the fundamental definition of organizational learning, the objective resides in the capacity of acting on behaviors (changing or sustaining); still to address the link between behavior changing and reaching higher levels of performance. In our specific case, Alpha, aims to establish a more collaborative way of working with an objective of positively impact employees' well-being at work, and thereby enhance their performance. Opportunities

of future paths of research reside in continuing to examine, within a longitudinal perspective, the impacts that Alpha's transformation project has had on organizational performance.

5.7. Theoretical and Managerial Contributions

As we proposed to study organizational adaptation, through a focus on how the shift in managers' technological frames affects the learning system of the organization, we aimed to treat a theoretical gap which consists in understudying the changes in the learning system (Argyris and Schon, 1978). This occurs when managers experience shifts in their mental schemes reflected in changes they have in their sense making of the environment around them as well as changes in their behaviors.

First and as previously exposed, the IS literature mobilized the 'organizational learning' concept to deal with a multitude of issues within different contexts without bringing a real focus on the 'inside' of the learning system as Argyris and Schon have stated. We attempted to answer this gap by analyzing the organizational adaptation within the frame of 'organizational learning system'. Driven by the belief that collecting evidence about how organizational adaptive actions have been initiated according to the 'organizational learning system' frame, has given us more powerful insights into 1) which components of the learning system has been affected by the strategic technological change that the organization launched and 2) how the learning/ adaptation process has occurred?

A second theoretical contribution resides in the adaptation of the theoretical model of Barr, Stimpert and Huff, 1992, initially developed within the strategy discipline to the information system one. While the original model developed links between environmental changes, changes in managers' mental models and organizational renewal, our model exhibits a far narrower and more specific consideration of mental models that is technological frames situated within a more specific context that accounts for the environmental technological change. Moreover, considering how shifts in managers' technological frames, due to environmental technological changes, affect the organizational learning system and thereby constitute a process of adaptation, is a novel approach in the IS field. A noteworthy point to raise is that, when dealing with managers' technological frames, we mobilized two undertakings of the concepts; Bijker's (1987) and Orlikowski and Gash's (1994). When these two frames are combined, more powerful insights were thus reached.

A third contribution is adding to the literature about Enterprise Social Networks use in organizations and its impact on behaviors. In fact, organizations keep at increasing their spending on IT investments (Gartner (2014), where collaboration technologies and social software constitute a highly increasing fraction of such investments, given their benefits to productivity, as well to innovation and knowledge management (Deloitte (2011). To ensure achieving returns from such investments, organizations are determined to ensure the successful adaptation and usage of these technologies (Burton-Jones and Straub Jr (2006). Responding to these calls, we addressed, along this study, the impact of the implementation of this technology on the organizational learning systems through the examination of the shifts of the technological frames between the old technology and the new one.

Our study contributes to the managerial knowledge through focusing the attention on the organizational capacity of adapting its structures to major technological new trends that characterize the information technology service industry. Through examining how Alpha proceeded to the digital transformation of its structures and procedures of work, this case study serves as a model of error detection and correction process which is the core of organizational learning itself and a ground for continuous adaptation of the organization to its environment. Aware of the importance of improving their adaptive capacity, organizations should work on improving their adaptive systems by capitalizing on their learning capacity.

Moreover, the concept of technological frames that we mobilized in this case study can serve an important usefulness for managers. This theoretical frame of assessing people sense making of technologies through the evaluations of three main aspects: the nature, the strategy and the objectives represent an interesting tool for managers to set the guidelines of IT-led transformation projects within their organizations.

An additional interesting contribution for managers resides in examining the link between IT and organizational learning and culture. This case study shows how values such as collaboration, sharing, mutual aid, spirit of initiative have been conveyed using the technology.

Our study presents though some limits that opens further paths of reflection. First, it would be interesting to follow the process by which the learning system shifts from one state to another because the emergence of new structures is a question of time where multiple iterations between the new structures that the new technology aims to implement and those actually enacted by people are likely to occur. Second, changes may occur not on all the dimensions of

the learning system which highlights an interesting question about the scope of learning. Different from the levels of learning or the types of learning, the scope of learning/adaptation would refer to the specific dimension of the learning system that has been emerged by the technological change

Chapter 6: General Conclusion

6.1. Conclusion of the studies:

In our thesis, we aimed at offering complementary explanations of the phenomenon of adaptation through different conceptual lenses. In fact, it constituted an attempt to offer complementary explanations about the adaptation phenomenon by an in-depth exploration at three levels: the individual level, the group level and the organizational level. More specifically, we uncovered the emergence of the adaptation processes by altering between levels and models. Each theoretical lens we used clearly refers to the level we aim at uncovering in our analysis.

On the individual level, knowledge workers' adaptation to technostress was explored through a novel perspective that goes beyond traditional conceptualizations of adaptation that focused attention on the coping mechanisms to punctual and disruptive events while ours considered a continuous adaptation process towards continuous states of technostress. In this first study (Chapter 3), we addressed two central research questions. We were first interested in applying a misfit perceptive to investigate technostress triggers with an emphasis on technology-related triggers and work environment related triggers. Second, we explored the mechanism through which knowledge workers shape their adaptive response to technostress. We developed a process model with three episodes.

On the group level, we leveraged the concepts of affordances and the technology's structure of use to assess the team's adaptive performance within the following adaptive structuration frames: the adaptive structuration theory (DeSanctis and Poole, 1994) and the revised adaptive structuration theory (Markus and Silver, 2008). In this second study (Chapter 4), we addressed our research questions about the team's adaptation to a new technology and proposed a theoretical framework that links three central concepts: the structures, the appropriation and the team adaptive performance. To assess how the adaptation process that the team engaged towards the new technology, we used the teams' shared mental models as a

reflection of their perceptions of their current situation and how the technology have altered (or not) their work procedures and routines.

On the organizational level, we explored the emergence of the organization's adaptive moves towards technological changes that occur in the environment. In doing so, we leveraged the concept of 'technological frames' (Orlikoswki and Gash, 1994) to assess the shift managers have known in their frames of references; and the theory of 'organizational learning' (Argyris and Schon, 1978) to evaluate the effects of such changes on the learning system in use within the organization. In this third study (Chapter 5), the results of our case study provided evidence about all our propositions which confirms the course of actions that we proposed concerning how organizations detect environmental signs, interpret them and develop responses to them. Based on the proposed theoretical framework; we claimed that the adaptive responses that an organization develops towards environmental change, result from a shift occurring in its cognitive system and may result in an organizational learning. More precisely, we proposed that organizations, when focus attention on the technological changes in their environment, proceed to their interpretation (as requiring adaptation, as significant or insignificant, as a threat, as an opportunity…).

In the following table 37, we remind the research questions of each study, expose the findings as well as the contributions.

	Study 1	Study 2	Study 3
Unit of analysis	Individual	Group	Organization
Research questions	RQ 1: How do technology and work context-related perceived misfits contribute to technostress? RQ 2: How do knowledge workers respond to technostress?	RQ 1: Which affordances are constituted in relationships between team members and the new tool? RQ 2: What adaptations occur when the group migrates from the old tool to the new one?	RQ 1: How do organizations engage adaptive actions, when facing technological environmental changes? Which process do they follow in doing so? RQ 2: To what extent can organizational adaptation be considered as a process of organizational learning?
Findings	States of technostress are essentially triggered by a combination of technology and environment-related factors. Technology-related factors are information overload and technology overload while environment-related triggers are the sense of constant urgency and the continuous interruptions. In order to engage the appropriate adaptation process to states of technostress, knowledge workers develop frames of actions based on different factors that we classify into: institutional, social and individual. Institutional factors concern the power that knowledge workers hold either through the information/ the expertise they have or through their hierarchical position within the organization. Institutional factors concern as well the perceived technological strategy of the firm the knowledge worker belongs to. Social factors regard the relationships within the group the knowledge workers closely work with. These factors consist in the team climate and the peers' behavior. Individual factors that influence the adaptation process are essentially the self-enhancement and the categorization.	The team's adaptive performance can be assessed through two lenses: the affordances that are constituted in relationships between the team members and the technology and the structure of use that emerge across the team members. The process of adaptation engaged by the team involves: - Beliefs that Dauphine Foundation members had before they adopted Zimbra. - Beliefs they had about the system based on notices that they received about training. - Experiences during implementation. - Experiences with using the new system	Organizations rely on mechanisms of attention that orientate their adaptation strategies. The role of leaders and dedicated organizational attention entities is crucial as they define the adaptation trajectories to follow. The attention managers pay to environmental changes is translated into changes in their technological frames (more specifically, managers experience changes in their perceptions about the nature/the structure of the technology, the strategy of the technology and the usage of the technology. The adaptation process that Alpha has engaged affected all the components of its organizational learning system which can be seen as a double loop learning.
Contributions	Add to the comprehension of technostress phenomenon through a misfit perspective. Add to the comprehension of the adaptation to technostress From a processual view of the adaptation to technostress: the responses to technostress are shaped over time with consideration to different filters (institutiaonal, social, individual). This process is repetitive and is subject to changes over time	Add to the comprehension of team adaptation through the adaptive team performance concept. The affordances that are constituted in relationship between the team members an the new technology offer rich insights about the underpinings of the changes occuring in the team's system of beliefs and explains the appropriation moves.	Adapt Barr, Stimpert and Huff (1992) framework to the IS field with a narrower consideration of mental models that is technological frames. Study technological frames through two complemntary frames: Orlikowski and Gash's (1994) and Bijker's (1987) Add to the lS literature about ESN in organizations by explaining the effects of this specific type of collaborative technology on the organizational mechanisms of communication and coordination.

6.2. General Discussion & Contributions to Theory:

Studying the phenomenon of adaptation with a multi-level approach offers richer insights compared to studying the same phenomenon on a single level. The richness resides in the different and complementary explanations that the alternate models offer. In this general discussion section, we present the common dimensions/ treats that the studies revealed about the adaptation process followed by the insights proper to each study, that once combined offer a richer view of the adaptation process.

First, the adaptation process is always triggered by a misfit that occurs within the entity's (individual, group, organization) environment. In fact, our three studies, present slight difference regarding the nature of the adaptation triggers. We distinguish the continuous stressful states (Study 1 /Chapter 3) and the disruptive technological events (Study 2 and 3/ Chapter 4 and 5) that result in engaging an adaptation process. Entities engage adaptation processes to regain the lost equilibrium: the objective that the entities (individual, teams or organizations) set when engaging an adaptation process constitutes a query of a lost equilibrium.

Second, the adaptation process follows a trajectory that develops and evolves over time. Our three studies gave insights about two crucial dimensions that characterize the adaptation process: the contextual dimension and the cognitive dimension.

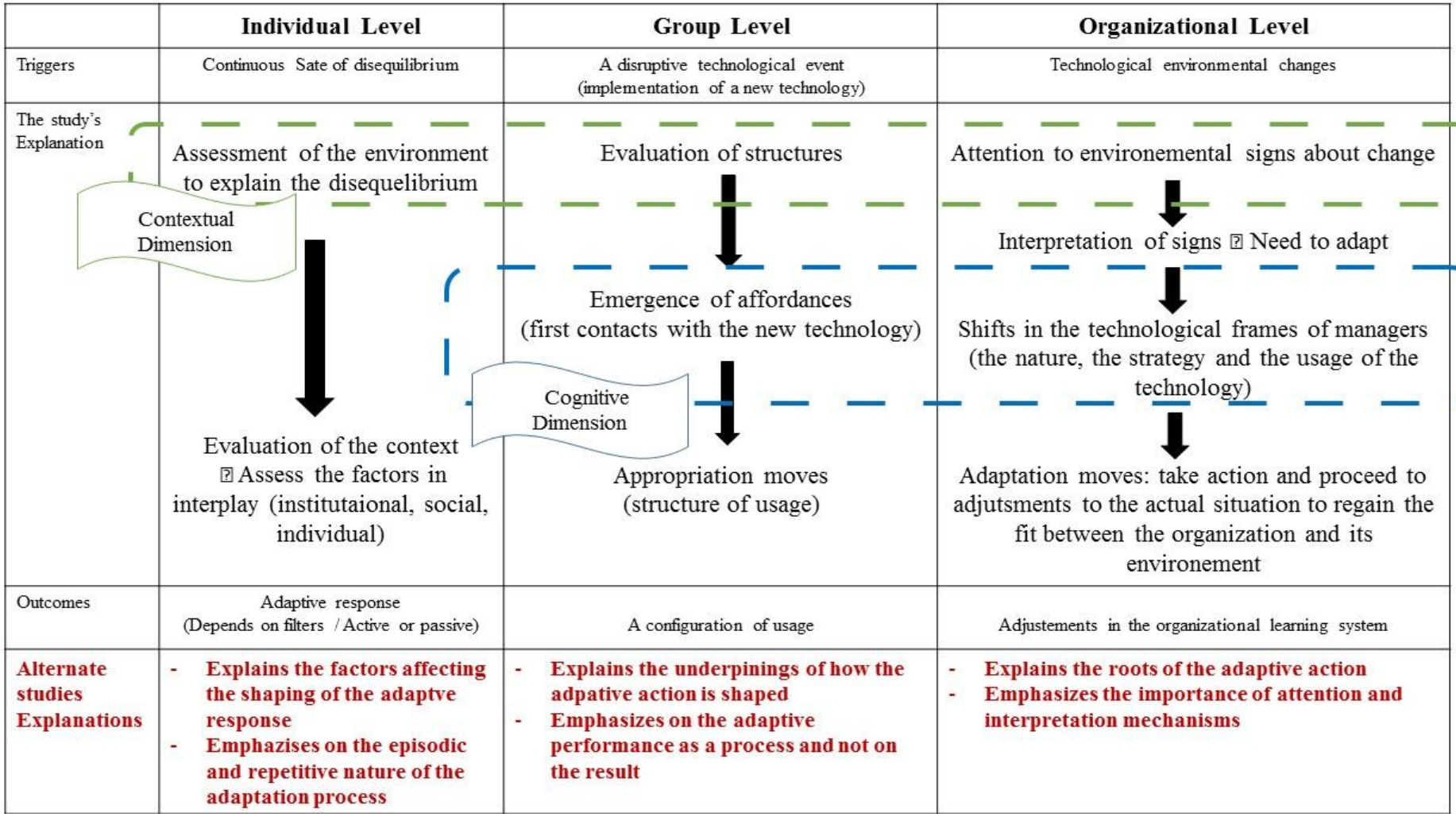


Figure 7: The alternate studies explanations

The context, which refers to the environment surrounding the entity, is present in our three models. In the first study (individual level/ chapter 3), knowledge workers proceed to the assessment of their environment in order to seek explanations of the technostress phenomenon. They, as well engage another assessment that concerns the different factors in interplay in their environment. In the second study (group level/ chapter4), the team members proceed to the evaluation of three sets of structures that form their environment (the technology structures, the work and organizational structures and the team internal environment) in order to shape perceptions about them. In our third study (organizational level/ chapter 5), Alpha focused its attention to environmental signs about new technological fashions. Through its institutionally-enabled watch of the environment, Alpha's managers proceeded to the collection of environmental signs and interpreted them.

The cognitive dimension concerns the effort that the entity engages to adjust their frame of reference that no longer match their environment. Because, the adaptation process is always triggered by a mismatch between the expectations and what the actual situation really offers, the first moves of adaptation consist in detecting the limitations of the actual frame of reference and searching ways to uncover them. In the first study, knowledge workers interpret the continuous disequilibrium in which they work as needing adaptation. In the second study, the team members' traditional shared models are challenged by the new situation resulting from the implementation of the new technology that altered their routines. In the third study, Alpha interpret the environmental signs as calls to change. Since it concerned the technologies within the organization, the managers revised their technological frames in a way that matches the new environmental opportunities.

More interestingly, our findings across studied levels present complementary dimensions that, once integrated, offers a richer image about the adaptation process.

Insight 1: From the individual level to the group and organization levels: How cyclic is the adaptation process and What factors do influence it?

The main finding of our study on adaptation at the individual level concerns the fact that the adaptation trajectory engaged by individuals is influenced by a variety of factors that we classify into: institutional, social and individual levels.

Indeed, the two main alternate explanation that are offered by the analysis of the adaptation on the individual are 1) the fact that the shaping of the adaptive action is influenced by different factors in interplay; and 2) the fact that the process of adaptation is both episodic and repetitive.

Insights from the analysis on the individual level, revealed that the adaptive response that individuals engage heavily rely on three sets of factors. The first set refer to the institutional context within which the individual act and includes the 'political' factors in interplay. The second set of filters refer to influence of the social sphere. The third set of factors concerns individual factors.

Thus exploring the adaptation process on the individual level added to the comprehension of the adaptation process by shedding light on both what factors surround the adaptive actions and what form the process takes.

Insight 2: From the group level to the individual and organization level

How do adaptive moves emerge and evolve?

The in-depth exploration of the group adaptation process in our second study contributed to the understanding of the adaptation process by providing insights about the development of the adaptation actions or moves, a dimension that did not appear at the other levels.

First, mobilizing the concepts of 'affordances' have enabled us to understand how the perceptions that team members hold about technologies, their usefulness and the place they take in their daily work are built-up. Moreover, it helped draw the paths of both the construction and the evolution of the relationships between the technology (englobing the functionalities, the objectives, the strategy and the role) and the individuals. Details are thus obtained about how individuals, members of the same work team and whose tasks are independent, perceive the change around them and how they shape interpretation and positions about the technology. Furthermore, the team members combine the perceptions they develop towards the technology with the perceptions they already hold about their close work environment in order to take the maximum of elements into consideration when engaging an adaptive action.

Second, the structure of usage has enabled to understand the distribution of appropriation moves among the team members. This concept has enabled us to aggregate the findings on the

individual level to the collective level. Teams, as a homogeneous entity, develop collective perceptions and interpretations of the new technology based on both their individual and shared frames of reference. More interesting is that individual frames of thinking (based on very subjective and personal takes) interact with shared ones; resulting in new frames. Thus, the adaptive moves, that have roots in the frames of references, involve personal and shared considerations and generates shared and configural actions.

Thus, exploring the underpinnings of the adaptive action in terms of emergence and evolution over time has added to the general understanding of the adaptation process by enlightening its steps and the ongoing of its emergence.

Insight 3: From the organization level to the group and individual level

What mechanisms do constitute the roots of adaptive actions?

What we learned from our third study about the adaptation process in organizations consists in the importance of the mechanisms of detecting environmental changes, interpreting them and engaging adaptive responses towards them.

In fact, organizations; through their capacity to institutionalize mechanisms and procedures, seek to develop the most suitable tools and techniques to detect the changes and evolutions within their environment. More specifically, they initiate attention mechanisms that allow them ensuring their environmental watch and intelligence. Attention mechanisms are environment oriented sensors that select the set of environmental changes which considerably affect the organization and need to be handled. Thus, the adaptation process that organizations engage to regain their initial equilibrium, is initiated based on the interpretation that the organization develops about the situation and how it has to be managed. This process affects the organizational systems in place because it challenges the way work is done and more importantly the frames of references within which managers make sense of things and take actions.

Thus, exploring the adaptation process on the organizational level gave us insights about the importance of the attention mechanisms and their role in detecting the misfits occurring between the organization and its environment. The analysis on the organization level added to the general understanding of the adaptation phenomenon by shedding light on the roots of the adaptive action.

The figure below summarizes how studying the adaptation process from different theoretical lenses and on different levels, labeled s alternate templates, added to the general comprehension of the phenomenon.

6.3. Limits and Future Research:

Although presenting insightful findings about the adaptation process to technology related disruptions, our thesis presents some limitations that opens new research avenues.

The principal limit concerns how field work has been designed and undertook. Criticisms might advocate that, in order to study a phenomenon on multiple levels, field work has to be done in only one context where data should be collected in one field (example: study three adaptation processes in one organization on three levels: individual, group and organization). Reasons behind this strategy reside in the opportunity that only one context offers to determine the interactions between the different levels as Rousseau (1985) proposed in her classification of multi-level models.

However, exploring three adaptation processes that occur at the same and that engage individual, group and organizational paths of actions within the same field is difficult to achieve given the difficulty of having access to this kind of fields and negotiating the terms of the research (individuals to interview, time to be spend on the site, ensuring that the interviewed entities have relationships between them to focus on their interactions…). Also, as the theme that we uncover is still considered by managers as a sensitive topic, conducting three parallel studies within the same context would certainly be problematic.

An additional difficulty resides in the fact that, in order to study organizational adaptation, we believe that we need a big structure with considerable institutionalized mechanisms. This would not be interesting in a small structure where adaptive adjustments are generally build up in a *ad hoc way* without following specific institutionalized paths, though representing an interesting topic to explore in future studies.

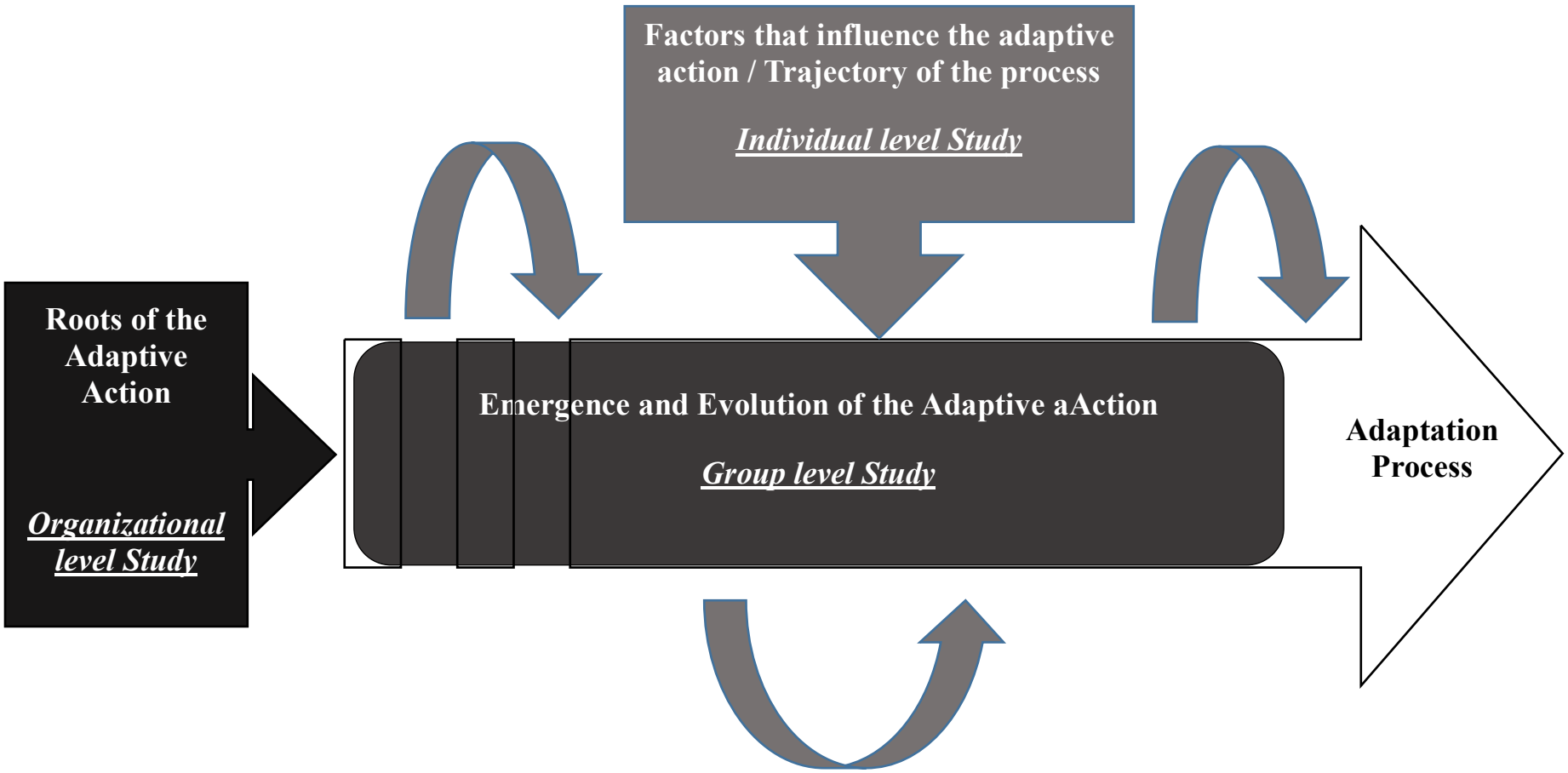
Moreover, to work on three levels at the same time would have required an integration of distinct theoretical lenses that consider different units of analysis from different levels, a fact that would have complicated the analysis and blinded us from interesting dimensions to analyze.

A second limit of our thesis concerns the situations that the three adaptation processes are engaged towards. In fact, in both the group-level and the organizational level studies, adaptation is engaged as a response to disruptive situations consisting in technology -related changes. The individual level study rather concerns situation of continuous disruptions and disequilibrium known as technostress. A shade of difference surely exists between the two situations but it does not affect the understanding of the adaptation phenomenon because both of them result in situations of disequilibrium that individuals undergo and that need to be handled.

Future research will focus on strengthening the theoretical insights of our thesis concerning the adaptation process engaged towards disruptive situations. Indeed, we were able to explain 1) how does the adaptive action take its roots in the environment oriented attention (organizational level study), 2) how it does emerge and evolve (group-level study), and 3) what cycle does it follow and what are the factors that influence it (individual level study).

In our future research, we aim at strengthening these findings by testing them in different settings. More precisely, each level of examination will be studied considering the limits that we have identified for each one. On the overall level, we aim at conducting research that focus on the interactions between entities from different levels and search the mutual influences between them.

Figure 8: Complementary findings to understand the adaptation phenomenon.



Bibliography

Åborg, C. and A. Billing (2003). "Health Effects of 'the Paperless Office'–evaluations of the introduction of electronic document handling systems." Behaviour and Information Technology **22**(6): 389-396.

Abraham, C., et al. (2013). "Enriching our theoretical repertoire: the role of evolutionary psychology in technology acceptance." European Journal of Information Systems **22**(1): 56-75.

Aguilar, F. J. (1967). Scanning the business environment, Macmillan.

Alge, B. J. (2001). "Effects of Computer Surveillance on Perceptions of Privacy and Procedural ustice." Journal of Applied Psychology **86**(4): 797.

Andreu, R. and C. Ciborra (1996). "Organisational learning and core capabilities development: the role of IT." the Journal of Strategic Information Systems **5**(2): 111-127.

Ansari, S. M., et al. (2010). "Made to fit: How practices vary as they diffuse." Academy of Management Review **35**(1): 67-92.

Argyris, C. and D. Schon (1978). "Organizational learning: A theory of action approach." Reading, MA: Addision Wesley.

Arnetz, B. B. and C. Wiholm (1997). "Technological stress: Psychophysiological symptoms in modern offices." Journal of psychosomatic research **43**(1): 35-42.

Arrow, H., et al. (2000). "Small groups as complex systems." Thousand Oaks, London, New Delhi.

Aubert, B. A., et al. (2008). "A multi-level, multi-theory perspective of information technology implementation." Information Systems Journal **18**(1): 45-72.

Ayyagari, R., et al. (2011). "Technostress: technological antecedents and implications." MIS quarterly **35**(4): 831-858.

Barki, H., et al. (2007). "Information system use-related activity: An expanded behavioral conceptualization of individual-level information system use." Information Systems Research **18**(2): 173-192.

Barley, S. R. (1986). "Technology as an occasion for structuring: Evidence from observations of CT scanners and the social order of radiology departments." Administrative science quarterly: 78-108.

Barr, P. S., et al. (1992). "Cognitive change, strategic action, and organizational renewal." Strategic management journal **13**(S1): 15-36.

Bartunek, J. M. (1984). "Changing interpretive schemes and organizational restructuring: The example of a religious order." Administrative science quarterly: 355-372.

Bartunek, J. M. and M. K. Moch (1987). "First-order, second-order, and third-order change and organization development interventions: A cognitive approach." The Journal of Applied Behavioral Science **23**(4): 483-500.

Baskerville, R., et al. (2000). Enterprise resource planning and organizational knowledge: patterns of convergence and divergence. Proceedings of the twenty first international conference on Information systems, Association for Information Systems.

Beaudry, A. and A. Pinsonneault (2005). "Understanding user responses to information technology: A coping model of user adaptation." MIS quarterly: 493-524.

Beck, R., et al. (2014). "Knowledge Exchange and Symbolic Action in Social Media-Enabled Electronic Networks of Practice: A multi-Level Perspective on Knowledge Seekers and Contributors." MIS quarterly **38**(4): 1245-1270.

Bélanger, F., et al. (2014). "Multilevel research in information systems: Concepts, strategies, problems, and pitfalls." Journal of the Association for Information Systems **15**(9): 614.

Benbasat, I., et al. (1986). "An experimental program investigating color-enhanced and graphical information presentation: an integration of the findings." Communications of the ACM **29**(11): 1094-1105.

Berger, P. and T. Luckmann (1967). The social construction of reality: A treatise on the sociology of education, Garden City, NY: Anchor Books.

Bettenhausen, K. L. (1991). "Five years of groups research: What we have learned and what needs to be addressed." Journal of management **17**(2): 345-381.

Bijker, W. E. (1987). "The social construction of Bakelite: Toward a theory of invention." The social construction of technological systems: 159-187.

Bijker, W. E. (1995). Of Bicycles, Bakelites and Bulbs. Toward a Theory of Sociotechnological Change, Cambridge, MA: MIT Press.

Boeker, W. (1989). "Strategic change: The effects of founding and history." Academy of Management journal **32**(3): 489-515.

Boynton, A. C., et al. (1994). "The influence of IT management practice on IT use in large organizations." MIS quarterly: 299-318.

Bridgman, T. and H. Willmott (2006). "Institutions and technology frameworks for understanding organizational change—the case of a major ICT outsourcing contract." The Journal of Applied Behavioral Science **42**(1): 110-126.

Brillhart, P. E. (2004). "Technostress in the workplace: Managing stress in the electronic workplace." Journal of American Academy of Business **5**(1/2): 302-307.

Brod, C. (1984). Technostress: The human cost of the computer revolution, Addison Wesley Publishing Company.

Brown, J. S. and P. Duguid (1991). "Organizational learning and communities-of-practice: Toward a unified view of working, learning, and innovation." Organization science **2**(1): 40-57

Bruque, S., et al. (2008). "Individual adaptation to IT-induced change: The role of social networks." Journal of Management Information Systems **25**(3): 177-206.

Buche, M. W., et al. (2007). "A longitudinal investigation of the effects of computer anxiety on performance in a computing-intensive environment." Journal of Information Systems Education **18**(4): 415.

Burke, C. S., et al. (2006). "Understanding team adaptation: a conceptual analysis and model." Journal of Applied Psychology **91**(6): 1189.

Burke, R. J. and C. L. Cooper (2006). "The new world of work and organizations: Implications for human resource management." Human Resource Management Review **16**(2): 83-85.

Burton-Jones, A. and M. J. Gallivan (2007). "Toward a deeper understanding of system usage in organizations: a multilevel perspective." MIS quarterly: 657-679.

Burton-Jones, A. and D. W. Straub Jr (2006). "Reconceptualizing system usage: An approach and empirical test." Information Systems Research **17**(3): 228-246.

Cartwright, S. and C. L. Cooper (1997). Managing workplace stress, Sage.

Chaffee, E. E. (1985). "Three models of strategy." Academy of Management Review **10**(1): 89-98.

Chakravarthy, B. S. (1982). "Adaptation: A promising metaphor for strategic management." Academy of Management Review **7**(1): 35-44.

Chan, D. (1998). "Functional relations among constructs in the same content domain at different levels of analysis: A typology of composition models." Journal of Applied Psychology **83**(2): 234.

Chandler, A. D. (1962). "Strategy and structure: Chapters in the history of the American enterprise." Massachusetts Institute of Technology Cambridge.

Charmaz, K. (2006). "Constructing grounded theory: A practical guide through qualitative research." SagePublications Ltd, London.

Chen, J., et al. (2011). "Moderated online communities and quality of user-generated content." Journal of Management Information Systems **28**(2): 237-268.

Chen, L. (2015). "Validating the Technostress Instrument using a Sample of Chinese Knowledge Workers." Journal of International Technology and Information Management **24**(1): 5.

Chen, L. and A. Muthitacharoen (2016). "An Empirical Investigation of the Consequences of Technostress: Evidence from China." Information Resources Management Journal (IRMJ) **29**(2): 14-36.

Child, J. (1972). "Organizational structure, environment and performance: The role of strategic choice." Sociology **6**(1): 1-22.

Clark, K. and S. Kalin (1996). "Technostressed Out? How to Cope in the Digital Age." Library Journal **121**(13): 30-32.

Cohen, S. G. and D. E. Bailey (1997). "What makes teams work: Group effectiveness research from the shop floor to the executive suite." Journal of management **23**(3): 239-290.

Cook, S. D. and D. Yanow (1993). "Culture and organizational learning." Journal of management inquiry **2**(4): 373-390.

Cooper, C. L., et al. (2001). Organizational stress: A review and critique of theory, research, and applications, Sage.

Cooper, R. B. and R. W. Zmud (1990). "Information technology implementation research: a technological diffusion approach." Management science **36**(2): 123-139.

Corbin, J. M. and A. Strauss (1990). "Grounded theory research: Procedures, canons, and evaluative criteria." Qualitative sociology **13**(1): 3-21.

Crossan, M. M. and I. Berdrow (2003). "Organizational learning and strategic renewal." Strategic management journal **24**(11): 1087-1105.

Crossan, M. M., et al. (1995). "Organizational learning: Dimensions for a theory." The International Journal of Organizational Analysis **3**(4): 337-360.

Cyert, R. M. and J. G. March (1963). "A behavioral theory of the firm." Englewood Cliffs, NJ **2**.

D'Arcy, J., et al. (2014). "Understanding Employee Responses to Stressful Information Security Requirements: A Coping Perspective." Journal of Management Information Systems **31**(2): 285-318.

D'Arcy, J., et al. (2014). "Reflecting on the "Dark Side" of information technology use." Communications of the Association for Information Systems **35**(1): 109-118.

Daft, R. L. and K. E. Weick (1984). "Toward a model of organizations as interpretation systems." Academy of Management Review **9**(2): 284-295.

Dansereau, F., et al. (1984). Theory testing in organizational behavior: The varient approach, Prentice Hall.

DeChurch, L. A. and J. R. Mesmer-Magnus (2010). "The cognitive underpinnings of effective teamwork: a meta-analysis." Journal of Applied Psychology **95**(1): 32.

Deloitte (2011). Metrics that Matter: Social Software for Business Performance.

DeSanctis, G. and M. S. Poole (1994). "Capturing the complexity in advanced technology use: Adaptive structuration theory." Organization science **5**(2): 121-147.

Dickinger, A., et al. (2008). "The role of perceived enjoyment and social norm in the adoption of technology with network externalities." European Journal of Information Systems **17**(1): 4-11.

DiMicco, J., et al. (2008). Motivations for social networking at work. Proceedings of the 2008 ACM conference on Computer supported cooperative work, ACM.

DiMicco, J. M., et al. (2009). People sensemaking and relationship building on an enterprise social network site. System Sciences, 2009. HICSS'09. 42nd Hawaii International Conference on, IEEE.

Dos Santos, B. and L. Sussman (2000). "Improving the return on IT investment: the productivity paradox." International journal of information management **20**(6): 429-440.

Dougherty, D. (1992). "A practice-centered model of organizational renewal through product innovation." Strategic management journal **13**(S1): 77-92.

Dubé, L. and G. Paré (2003). "Rigor in information systems positivist case research: current practices, trends, and recommendations." MIS quarterly: 597-636.

Easton, G. (2010). "Critical realism in case study research." Industrial Marketing Management **39**(1): 118-128.

Edwards, J. R. and C. L. Cooper (1988). "The impacts of positive psychological states on physical health: A review and theoretical framework." Social science & medicine **27**(12): 1447-1459.

Eisenhardt, K. M. (1989). "Building theories from case study research." Academy of Management Review **14**(4): 532-550.

Eisenhardt, K. M. and J. A. Martin (2000). "Dynamic capabilities: what are they?" Strategic management journal **21**(10-11): 1105-1121.

El Sawy, O. A. and T. C. Pauchant (1988). "Triggers, templates and twitches in the tracking of emerging strategic issues." Strategic management journal **9**(5): 455-473.

Faraj, S., et al. (2011). "Knowledge collaboration in online communities." Organization science **22**(5): 1224-1239.

Felin, T. and N. J. Foss (2005). "Strategic organization: A field in search of micro-foundations." Strategic organization **3**(4): 441.

Fiol, C. M. (1994). "Consensus, diversity, and learning in organizations." Organization science **5**(3): 403-420.

Fiol, C. M. and M. A. Lyles (1985). "Organizational learning." Academy of Management Review **10**(4): 803-813.

Fox, M. L., et al. (1993). "Effects of stressful job demands and control on physiological and attitudinal outcomes in a hospital setting." Academy of Management journal **36**(2): 289-318.

Fulk, J. (1993). "Social construction of communication technology." Academy of Management journal **36**(5): 921-950.

Fuller, R. M. and A. R. Dennis (2009). "Does fit matter? The impact of task-technology fit and appropriation on team performance in repeated tasks." Information Systems Research **20**(1): 2-17.

Fuller, R. M., et al. (2006). "E-learning and individual characteristics: The role of computer anxiety and communication apprehension." Journal of Computer Information Systems **46**(4): 103-115.

Gartner (2014). Gartner Says Worldwide IT Spending on Pace to Reach $3.8 Trillion in 2014.

Gaver, W. W. (1991). Technology affordances. Proceedings of the SIGCHI conference on Human factors in computing systems, ACM.

Gherardi, S. (1999). "Learning as Problem-driven or Learning in the Face of Mystery?" Organization studies **20**(1): 101-123.

Gioia, D. A., et al. (1989). "Communication and cognition in appraisal: A tale of two paradigms." Organization studies **10**(4): 503-529.

Glaser, B. and A. Strauss (1967). "The discovery ofgrounded theory." London: Weidenfeld and Nicholson **24**(25): 288-304.

Goodhue, D. L. (1998). "Development and measurement validity of a task-technology fit instrument for user evaluations of information system." Decision sciences **29**(1): 105-138.

Goodhue, D. L. and R. L. Thompson (1995). "Task-technology fit and individual performance." MIS quarterly: 213-236.

Goodman, P. S. and E. D. Darr (1998). "Computer-aided systems and communities: Mechanisms for organizational learning in distributed environments." MIS quarterly: 417-440.

Griffith, T. L., et al. (2003). "Virtualness and knowledge in teams: Managing the love triangle of organizations, individuals, and information technology." MIS quarterly: 265-287.

Grint, K. and S. Woolgar (1992). "Computers, guns, and roses: what's social about being shot?" Science, Technology, & Human Values **17**(3): 366-380.

Grint, K. and S. Woolgar (1995). "On some failures of nerve in constructivist and feminist analyses of technology." Science, technology & human values **20**(3): 286-310.

Grint, K. and S. Woolgar (1997). The machine at work: Technology, work and society, Cambridge: Polity Press.

Grudin, J. (2006). Enterprise knowledge management and emerging technologies. Proceedings of the 39th Annual Hawaii International Conference on System Sciences (HICSS'06), IEEE.

Grudin, J. (2006). Enterprise knowledge management and emerging technologies. System Sciences, 2006. HICSS'06. Proceedings of the 39th Annual Hawaii International Conference on, IEEE.

Gully, S. (2000). Work teams research. Work teams: Past, present and future, Springer**:** 25-44.

Guzzo, R. A. and M. W. Dickson (1996). "Teams in organizations: Recent research on performance and effectiveness." Annual review of psychology **47**(1): 307-338.

Guzzo, R. A. and G. P. Shea (1992). "Group performance and intergroup relations in organizations." Handbook of industrial and organizational psychology **3**: 269-313.

Hackman, J. R. (1992). Group influences on individuals in organizations, Consulting Psychologists Press.

Hackman, J. R. (2003). "Learning more by crossing levels: Evidence from airplanes, hospitals, and orchestras." Journal of organizational behavior **24**(8): 905-922.

Hannan, M. T. and J. Freeman (1984). "Structural inertia and organizational change." American sociological review: 149-164.

Hedberg, B. (1981). How do Organizations learn and unlearn? Handbook of organizational design. I. P. C. N. W. H. S. (Eds.). London, Oxford Univresity Press**:** 8-27.

Hitt, L. M. and E. Brynjolfsson (1996). "Productivity, business profitability, and consumer surplus: three different measures of information technology value." MIS quarterly: 121-142.

Hrebiniak, L. G. and W. F. Joyce (1985). "Organizational adaptation: Strategic choice and environmental determinism." Administrative science quarterly: 336-349.

Huber, G. P. (1991). "Organizational learning: The contributing processes and the literatures." Organization science **2**(1): 88-115.

Hutchby, I. (2001). "Technologies, texts and affordances." Sociology **35**(2): 441-456.

Huysman, M. H., Fisher, S. J. and Heng, M. S. (1994). "An organizational learning perspective on information systems planning." the Journal of Strategic Information Systems **3**(3): 165-177.

Ilgen, D. R., et al. (2005). "Teams in organizations: From input-process-output models to IMOI models." Annu. Rev. Psychol. **56**: 517-543.

Jarvenpaa, S. L. (1989). "The effect of task demands and graphical format on information processing strategies." Management science **35**(3): 285-303.

Jelinek, M. (1979). Institutionalizing innovation: A study of organizational learning systems, Praeger Publishers.

Jennings, D. F. and S. L. Seaman (1994). "High and low levels of organizational adaptation: An empirical analysis of strategy, structure, and performance." Strategic management journal **15**(6): 459-475.

Jex, S. M. and T. C. Elacqua (1999). "Time management as a moderator of relations between stressors and employee strain." Work & Stress **13**(2): 182-191.

Johnson, S. L., et al. (2014). "Emergence of Power Laws in Online Communities: The Role of Social Mechanisms and Preferential Attachment." MIS quarterly **38**(3): 795-808.

Kalika, M., et al. (2007). "La théorie du millefeuille et l'usage des TIC dans l'entreprise." Revue française de gestion(3): 117-129.

Kane, G. C. and G. Labianca (2011). "IS avoidance in health-care groups: A multilevel investigation." Information Systems Research **22**(3): 504-522.

Karuppan, C. M. (1997). "Advanced manufacturing technology and stress: technology and management support policies." International Journal of Technology Management **14**(2-4): 254-264.

Katz, D. and R. L. Kahn (1966). "The psychology of organizations." New York: HR Folks International.

Kelly, D. and T. L. Amburgey (1991). "Organizational inertia and momentum: A dynamic model of strategic change." Academy of Management journal **34**(3): 591-612.

Kiesler, S. and L. Sproull (1982). "Managerial response to changing environments: Perspectives on problem sensing from social cognition." Administrative science quarterly: 548-570.

King, R. and V. Sethi (1997). "The moderating effect of organizational commitment on burnout in information systems professionals." European Journal of Information Systems **6**(2): 86-96.

King, W. R. (2001). "Strategies for creating a learning organization." Information Systems Management **18**(1): 12-20.

Kinman, G. and F. Jones (2005). "Lay representations of workplace stress: What do people really mean when they say they are stressed?" Work & Stress **19**(2): 101-120.

Klein, K. J., et al. (1994). "Levels issues in theory development, data collection, and analysis." Academy of Management Review **19**(2): 195-229.

Klopping, I. M. and E. McKinney (2004). "Extending the technology acceptance model and the task-technology fit model to consumer e-commerce." Information Technology, Learning, and Performance Journal **22**(1): 35.

Korunka, C. and O. Vitouch (1999). "Effects of the implementation of information technology on employees' strain and job satisfaction: A context-dependent approach." Work & Stress **13**(4): 341-363.

Kozlowski, S. W. and B. S. Bell (2003). "Work groups and teams in organizations." Handbook of psychology.

Kozlowski, S. W., et al. (1999). "Developing adaptive teams: A theory of compilation and performance across levels and time." Pulakos (Eds.), The changing nature of performance: Implications for staffing, motivation, and development: 240-292.

Kozlowski, S. W. and D. R. Ilgen (2006). "Enhancing the effectiveness of work groups and teams." Psychological science in the public interest **7**(3): 77-124.

Kozlowski, S. W. and K. J. Klein (2000). "A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes."

Kudaravalli, S. and S. Faraj (2008). "The structure of collaboration in electronic networks." Journal of the Association for Information Systems **9**(10): 1.

Kudaravalli, S. and S. Faraj (2008). "The structure of collaboration in electronic networks." Journal of the Association for Information Systems **9**(10/11): 706.

Kudyba, S. and R. Diwan (2002). "Research report: Increasing returns to information technology." Information Systems Research **13**(1): 104-111.

Lamb, R. and R. Kling (2003). "Reconceptualizing users as social actors in information systems research." MIS quarterly: 197-236.

Lapointe, L. and S. Rivard (2007). "A triple take on information system implementation." Organization science **18**(1): 89-107.

Lazarus, R. S. (1966). "Psychological stress and the coping process."

Lazarus, R. S. (1990). "Theory-based stress measurement." Psychological inquiry **1**(1): 3-13.

Lazarus, R. S., et al. (1974). "The psychology of coping: Issues of research and assessment." Coping and adaptation: 249-315.

Lazarus, R. S. and S. Folkman (1984). Stress, appraisal, and coping, Springer publishing company.

Lazarus, R. S. and S. Folkman (1987). "Transactional theory and research on emotions and coping." European Journal of personality **1**(3): 141-169.

Lee, F. S., et al. (2003). "Virtual community informatics: A review and research agenda." JITTA: Journal of Information Technology Theory and Application **5**(1): 47.

Lee, F. S., et al. (2003). "Virtual community informatics: A review and research agenda." Journal of Information Technology Theory and Application (JITTA) **5**(1): 5.

Leonard-Barton, D. (1988). "Implementation as mutual adaptation of technology and organization." Research policy **17**(5): 251-267.

Leonard-Barton, D. and I. Deschamps (1988). "Managerial influence in the implementation of new technology." Management science **34**(10): 1252-1265.

Leonardi, P. M. (2011). "When flexible routines meet flexible technologies: Affordance, constraint, and the imbrication of human and material agencies." MIS quarterly **35**(1): 147-167.

Leonardi, P. M. (2013). "Theoretical foundations for the study of sociomateriality." Information and Organization **23**(2): 59-76.

Leonardi, P. M. and S. R. Barley (2008). "Materiality and change: Challenges to building better theory about technology and organizing." Information and Organization **18**(3): 159-176.

Leonardi, P. M., et al. (2013). "Enterprise social media: Definition, history, and prospects for the study of social technologies in organizations." Journal of Computer-Mediated Communication **19**(1): 1-19.

Levi, L. (1974). "Psychosocial stress and disease: A conceptual model." Life stress and illness: 840.

Levine, H. G. and D. Rossmoore (1994). "Politics and the function of power in a case study of IT implementation." Journal of Management Information Systems **11**(3): 115-133.

Levine, J. M. and R. L. Moreland (1990). "Progress in small group research." Annual review of psychology **41**(1): 585-634.

Lewis, K. (2003). "Measuring transactive memory systems in the field: scale development and validation." Journal of Applied Psychology **88**(4): 587.

Lewis, W., et al. (2003). "Sources of influence on beliefs about information technology use: An empirical study of knowledge workers." MIS quarterly: 657-678.

Liang, D. W., et al. (1995). "Group versus individual training and group performance: The mediating role of transactive memory." Personality and Social Psychology Bulletin **21**(4): 384-393.

Lin, T.-C. and C.-C. Huang (2008). "Understanding knowledge management system usage antecedents: An integration of social cognitive theory and task technology fit." Information & Management **45**(6): 410-417.

Lyytinen, K. and D. Robey (1999). "Learning failure in information systems development." Information Systems Journal **9**(2): 85-101.

Lyytinen, K. and G. M. Rose (2006). "Information system development agility as organizational learning." European Journal of Information Systems **15**(2): 183-199.

Ma, M. and R. Agarwal (2007). "Through a glass darkly: Information technology design, identity verification, and knowledge contribution in online communities." Information Systems Research **18**(1): 42-67.

Magni, M., et al. (2012). "Everybody needs somebody: The influence of team network structure on information technology use." Journal of Management Information Systems **29**(3): 9-42.

Majchrzak, A. and J. Cotton (1988). "A longitudinal study of adjustment to technological change: From mass to computer-automated batch production." Journal of Occupational Psychology **61**(1): 43-66.

Malhotra, N. K., et al. (2004). "Internet users' information privacy concerns (IUIPC): The construct, the scale, and a causal model." Information Systems Research **15**(4): 336-355.

Markham, S. E., et al. (2010). "Leader–member exchange, shared values, and performance: Agreement and levels of analysis do matter." The Leadership Quarterly **21**(3): 469-480.

Marks, M. A., et al. (2001). "A temporally based framework and taxonomy of team processes." Academy of Management Review **26**(3): 356-376.

Markus, M. L. (1983). "Power, politics, and MIS implementation." Communications of the ACM **26**(6): 430-444.

Markus, M. L. (2004). "Technochange management: using IT to drive organizational change." Journal of Information technology **19**(1): 4-20.

Markus, M. L. and M. S. Silver (2008). "A foundation for the study of IT effects: A new look at DeSanctis and Poole's concepts of structural features and spirit." Journal of the Association for Information Systems **9**(10/11): 609.

Martin, J. (1982). Stories and scripts in organizational settings. Cognitive social psychology. I. A. H. A. I. (Eds.). New York, Elsevier-North Holland. **:** 225-305.

Maruping, L. M. and R. Agarwal (2004). "Managing team interpersonal processes through technology: a task-technology fit perspective." Journal of Applied Psychology **89**(6): 975.

Maruping, L. M. and M. Magni (2012). "What's the weather like? The effect of team learning climate, empowerment climate, and gender on individuals' technology exploration and use." Journal of Management Information Systems **29**(1): 79-114.

Mason, R. O. and I. I. Mitroff (1973). "A program for research on management information systems." Management science **19**(5): 475-487.

Mathieson, K. and M. Keil (1998). "Beyond the interface: Ease of use and task/technology fit." Information & Management **34**(4): 221-230.

McAfee, A. P. (2006). "Enterprise 2.0: The dawn of emergent collaboration." MIT Sloan Management Review **47**(3): 21.

McCall, M. W. and R. E. Kaplan (1985). Whatever it takes: Decision makers at work, Prentice Hall.

McGrath, J. E. (1984). Groups: Interaction and performance, Prentice-Hall Englewood Cliffs, NJ.

Meyer, A. D. (1982). "Adapting to environmental jolts." Administrative science quarterly: 515-537.

Mintzberg, H. and J. A. Waters (1982). "Tracking strategy in an entrepreneurial firm1." Academy of Management journal **25**(3): 465-499.

Mitroff, I. I. and R. H. Kilmann (1976). "On organization stories: An approach to the design and analysis of organizations through myths and stories." The management of organization design **1**(189-207).

Monge, P. R., et al. (1992). "Communication and motivational predictors of the dynamics of organizational innovation." Organization science **3**(2): 250-274.

Moore, J. E. (2000). "One road to turnover: An examination of work exhaustion in technology professionals." MIS quarterly: 141-168.

Moreland, R. L., et al. (1996). "Socially shared cognition at work: Transactive memory and group performance."

Moreland, R. L., et al. (1994). "Back to the future: Social psychological research on groups." Journal of Experimental Social Psychology **30**(6): 527-555.

Moreland, R. L. and L. Myaskovsky (2000). "Exploring the performance benefits of group training: Transactive memory or improved communication?" Organizational behavior and human decision processes **82**(1): 117-133.

Morgeson, F. P. and D. A. Hofmann (1999). "The structure and function of collective constructs: Implications for multilevel research and theory development." Academy of Management Review **24**(2): 249-265.

Newman, M. and D. Robey (1992). "A social process model of user-analyst relationships." MIS quarterly: 249-266.

Norman, D. A. (1990). Cognitive artifacts, Department of Cognitive Science, University of California, San Diego.

O'Leary, M. B., et al. (2014). "Beyond Being There: The Symbolic Role of Communication and Identification in Perceptions of Proximity to Geographically Dispersed Colleagues." MIS quarterly **38**(4): 1219-1243.

O'Leary, M. B., et al. (2014). "Beyond Being There: The Symbolic Role of Communication and Identification in perceptions of Proximity to Geographically Dispersed Colleagues." MIS quarterly **38**(4): 1219-1243.

Ocasio, W. (1997). "Towards an attention-based view of the firm." Strategic management journal: 187-206.

Orlikowski, W. J. (1992). "The duality of technology: Rethinking the concept of technology in organizations." Organization science **3**(3): 398-427.

Orlikowski, W. J. (1996). "Improvising organizational transformation over time: A situated change perspective." Information Systems Research **7**(1): 63-92.

Orlikowski, W. J. and S. R. Barley (2001). "Technology and institutions: What can research on information technology and research on organizations learn from each other?" MIS quarterly **25**(2): 145-165.

Orlikowski, W. J. and D. C. Gash (1994). "Technological frames: making sense of information technology in organizations." ACM Transactions on Information Systems (TOIS) **12**(2): 174-207.

Orlikowski, W. J. and D. Robey (1991). "Information technology and the structuring of organizations." Information Systems Research **2**(2): 143-169.

Pawlowski, S. D., et al. (2007). "Focusing the research agenda on burnout in IT: social representations of burnout in the profession." European Journal of Information Systems **16**(5): 612-627.

Pentland, B. T. and M. S. Feldman (2005). "Organizational routines as a unit of analysis." Industrial and corporate change **14**(5): 793-815.

Petter, S. C. and M. J. Gallivan (2004). Toward a framework for classifying and guiding mixed method research in information systems. System Sciences, 2004. Proceedings of the 37th Annual Hawaii International Conference on, IEEE.

Pfeffer, J. and C. T. Fong (2005). "Building organization theory from first principles: The self-enhancement motive and understanding power and influence." Organization science **16**(4): 372-388.

Poole, M. S., et al. (1988). Conflict management and group decision support systems. Proceedings of the 1988 ACM conference on Computer-supported cooperative work, ACM.

Poole, M. S., et al. (1985). "Group decision-making as a structurational process." Quarterly Journal of Speech **71**(1): 74-102.

Preece, J. (2001). "Sociability and usability in online communities: Determining and measuring success." Behaviour & Information Technology **20**(5): 347-356.

Quinn, J. B. (1980). Strategies for change: Logical incrementalism, Irwin Professional Publishing.

Ragu-Nathan, T., et al. (2008). "The consequences of technostress for end users in organizations: Conceptual development and empirical validation." Information Systems Research **19**(4): 417-433.

Ren, Y., et al. (2012). "Building Member Attachment in Online Communities: Applying Theories of Group Identity and Interpersonal Bonds." MIS quarterly **36**(3): 841-864.

Rice, R. and U. Gattiker (1999). "New media and organiza Vol. 13, No. 1 Stein, EW. & Zwass, V.(1995). Actualizing organizational memory with information systems." Information Systems Research **6**(2): 85-113.

Rice, R. E. and E. M. Rogers (1980). "Reinvention in the innovation process." Science Communication **1**(4): 499-514.

Riedl, R. (2012). "On the biology of technostress: literature review and research agenda." ACM SIGMIS Database **44**(1): 18-55.

Riemer, K., et al. (2009). "eCollaboration: On the nature and emergence of communication and collaboration technologies." Electronic Markets **19**(4): 181-188.

Robey, D. (1996). "Research commentary: diversity in information systems research: threat, promise, and responsibility." Information Systems Research **7**(4): 400-408.

Rousseau, D. M. (1985). "Issues of level in organizational research: Multi-level and cross-level perspectives." Research in organizational behavior **7**(1): 1-37.

Salancik, G. R. and J. Pfeffer (1978). "A social information processing approach to job attitudes and task design." Administrative science quarterly: 224-253.

Salanova, M., et al. (2013). "The dark side of technologies: technostress among users of information and communication technologies." International journal of psychology **48**(3): 422-436.

Salaway, G. (1987). "An organizational learning approach to information systems development." MIS quarterly: 245-264.

Sandblad, B., et al. (2003). "Work environment and computer systems development." Behaviour and Information Technology **22**(6): 375-387.

Schendel, D. and C. W. Hofer (1979). Strategic management: A new view of business policy and planning, Little, Brown.

Schmitz, J. and J. Fulk (1991). "Organizational colleagues, media richness, and electronic mail a test of the social influence model of technology use." Communication research **18**(4): 487-523.

Scott, P. (1995). The meanings of mass higher education, McGraw-Hill Education (UK).

Shapiro, J. (1983). "Family reactions and coping strategies in response to the physically ill or handicapped child: A review." Social science & medicine **17**(14): 913-931.

Shrivastava, P. and I. Mitroff (1982). Frames of reference managers use: A study in applied sociology of knowledge, New York University, Graduate School of Business Administration.

Shu, Q., et al. (2011). "The impact of computer self-efficacy and technology dependence on computer-related technostress: A social cognitive theory perspective." International Journal of Human-Computer Interaction **27**(10): 923-939.

Smith, M. J. and P. Carayon (1995). "New technology, automation, and work organization: stress problems and improved technology implementation strategies." International Journal of Human Factors in Manufacturing **5**(1): 99-116.

Spruell, G. (1987). "Work fever." Training & Development Journal.

Srivastava, S. C., et al. (2015). "Technostress creators and job outcomes: theorising the moderating influence of personality traits." Information Systems Journal **25**(4): 355-401.

Starbuck, W. H., et al. (1978). "Responding to crises." Journal of business administration **9**(2): 111-137.

Stasser, G., et al. (1995). "Expert roles and information exchange during discussion: The importance of knowing who knows what." Journal of Experimental Social Psychology **31**(3): 244-265.

Stein, E. W. and B. Vandenbosch (1996). "Organizational learning during advanced system development: Opportunities and obstacles." Journal of Management Information Systems **13**(2): 115-136.

Stein, E. W. and V. Zwass (1995). "Actualizing organizational memory with information systems." Information Systems Research **6**(2): 85-117.

Steinhuser, M., et al. (2011). Towards a measurement model of corporate social software success-evidences from an exploratory multiple case study. System Sciences (HICSS), 2011 44th Hawaii International Conference on, IEEE.

Strader, T. J., et al. (2007). "Perceived network externalities and communication technology acceptance." European Journal of Information Systems **16**(1): 54-65.

Sundstrom, E., et al. (2000). "Work groups: From the Hawthorne studies to work teams of the 1990s and beyond." Group Dynamics: Theory, Research, and Practice **4**(1): 44.

Tams, S., et al. (2014). "NeuroIS-alternative or complement to existing methods? Illustrating the holistic effects of neuroscience and self-reported data in the context of technostress research." Journal of the Association for Information Systems **15**(10): 723.

Tarafdar, M., et al. (2014). "Examining impacts of technostress on the professional salesperson's behavioural performance." Journal of Personal Selling & Sales Management **34**(1): 51-69.

Tarafdar, M., et al. (2015). "The dark side of information technology." MIT Sloan Management Review **56**(2): 61.

Tarafdar, M., et al. (2013). "The dark side of information technology use." Information Systems Journal **23**(3): 269-275.

Tarafdar, M., et al. (2011). Examining Impacts of Technostress on the Professional Salesperson's Performance. AMCIS.

Tarafdar, M., et al. (2007). "The impact of technostress on role stress and productivity." Journal of Management Information Systems **24**(1): 301-328.

Taylor, S. and P. Todd (1995). "Decomposition and crossover effects in the theory of planned behavior: A study of consumer adoption intentions." International journal of research in marketing **12**(2): 137-155.

Taylor, S. and P. A. Todd (1995). "Understanding information technology usage: A test of competing models." Information Systems Research **6**(2): 144-176.

Teece, D. and G. Pisano (1994). "The dynamic capabilities of firms: an introduction." Industrial and corporate change **3**(3): 537-556.

Teece, D. J. (2007). "Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance." Strategic management journal **28**(13): 1319-1350.

Teece, D. J., et al. (1997). "Dynamic capabilities and strategic management." Strategic management journal: 509-533.

Templeton, G. F., et al. (2002). "Development of a measure for the organizational learning construct." Journal of Management Information Systems **19**(2): 175-218.

Thatcher, J. B. and P. L. Perrewe (2002). "An empirical examination of individual traits as antecedents to computer anxiety and computer self-efficacy." MIS quarterly: 381-396.

Thompson, J. D. (1967). Organizations in action: Social science bases of administrative theory, Transaction publishers.

Thompson, R. L., et al. (1991). "Personal computing: toward a conceptual model of utilization." MIS quarterly: 125-143.

Treem, J. W. and P. M. Leonardi (2012). "Social media use in organizations: Exploring the affordances of visibility, editability, persistence, and association." Communication yearbook **36**: 143-189.

Tyre, M. J. and W. J. Orlikowski (1994). "Windows of opportunity: Temporal patterns of technological adaptation in organizations." Organization science **5**(1): 98-118.

Walsh, J. P. and L. Fahey (1986). "The role of negotiated belief structures in strategy making." Journal of management **12**(3): 325-338.

Walsh, J. P., et al. (1988). "Negotiated belief structures and decision performance: An empirical investigation." Organizational behavior and human decision processes **42**(2): 194-216.

Walsham, G. (1995). "Interpretive case studies in IS research: nature and method." European Journal of Information Systems **4**(2): 74-81.

Walsham, G. (2006). "Doing interpretive research." European Journal of Information Systems **15**(3): 320-330.

Wang, K., et al. (2008). "Technostress under different organizational environments: An empirical investigation." Computers in Human Behavior **24**(6): 3002-3013.

Wattal, S., et al. (2010). "Network externalities and technology use: a quantitative analysis of intraorganizational blogs." Journal of Management Information Systems **27**(1): 145-174.

Wegner, D. M. (1986). Transactive Memory: A contemporary analysis of the group mind New York, Springer-Verlag.

Wegner, D. M., et al. (1991). "Transactive memory in close relationships." Journal of personality and social psychology **61**(6): 923.

Wegner, D. M., et al. (1985). Cognitive interdependence in close relationships. Compatible and incompatible relationships, Springer**:** 253-276.

Weick, K. E. (1979). "Cognitive processes in organizations." Research in organizational behavior **1**(1): 41-74.

Weick, K. E. and M. G. Bougon (1986). "Organizations as cognitive maps: Charting ways to success and failure." The thinking organization: 102-135.

Weil, M. M. and L. D. Rosen (1997). Technostress: Coping with technology@ work@ home@ play, Wiley.

Welford, A. T. (1973). "Stress and performance." Ergonomics **16**(5): 567-580.

Whitaker, J., et al. (2010). "Organizational learning and capabilities for onshore and offshore business process outsourcing." Journal of Management Information Systems **27**(3): 11-42.

Winter, S. G. (2003). "Understanding dynamic capabilities." Strategic management journal **24**(10): 991-995.

Wynn Jr, D. and C. K. Williams (2012). "Principles for conducting critical realist case study research in information systems." MIS quarterly **36**(3): 787-810.

Yin, R. (1984). case study research. Beverly Hills, ca: Sage.

Zammuto, R. F., et al. (2007). "Information technology and the changing fabric of organization." Organization science **18**(5): 749-762.

Zigurs, I. and B. K. Buckland (1998). "A theory of task/technology fit and group support systems effectiveness." MIS quarterly: 313-334.