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Abstract

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Introduction

IT innovation research has emerged as one of the major streams of research within the field of Information System (IS). The popularity and importance of this stream continues to grow as Information Technology continues to penetrate into virtually every task of modern organization. Exemplar IT research have stressed the importance of mindful IT innovation adoption in paving the path to organizational success (Swanson and Ramiller 2004), it has further been argued that innovation can be "*the key determinant of competitiveness*" (Fichman 2000). Large-scale empirical data have provided strong support for the hypothesis that IT enabled innovation has

been the determining factor in differentiating between “winners” and “losers” within different industries (McAfee and Brynjolfsson 2008).

Nevertheless, despite the effort put into innovation research by students of several disciplines (including information systems, organization theory, political science, and sociology), our understanding of innovation in organizations has remained relatively primitive. According to a review conducted by Wolfe (1994), “*the most **consistent** theme found in the organizational innovation literature is that its research results have been **inconsistent**.”* (p. 405). The situation is similar with regard to IT innovations in particular; a meta-analysis of innovation models in IS literature by Lyytinen and Damsgaard (2001) reveals R-squares constantly less than 40% in different studies.

Because of these shortcomings, scholars have called for utilizing more innovative perspectives for the study of IT innovation (Fichman 2004). In this review and theory development paper, our approach to account for the empirical inconsistencies and overcome the theoretical limitations, is to propose a typological theory - which by definition incorporates a set of mid-range theories (Doty & Glick 1994). Such mid-range theories are “*moderately abstract, [have] limited scope, and can easily lead to testable hypotheses*” (Gregor 2006). Our research questions in this essay are “*what are the theoretically meaningful typifications (ideal types) of IT innovation adoptions by organizations*?”, and “*what configurations of first-order constructs form these ideal types*?”

In the first part of the paper, we situate our review around the mechanisms of IT innovation diffusion and synergies among different constructs that facilitate these mechanisms as opposed to merely structural variables that predict IT adoption. Previous research has identified an extensively large number of variables that could be associated with IT adoption. For example, in a meta-analysis of a sample of empirical diffusion of IT innovation studies between 1992 and 2003, Jeyaraj et al. (2006) identified 135 independent variables, 8 dependent variables, and 505

relationships between independent and dependent variables. It has been argued that too much focus on statistical models and the "laundry lists" of variables included in them, has in fact hindered a fruitful accumulation of knowledge. In other words, as this list of such variables grows, the prospect for a theoretical integration explaining why and how innovations come to be adopted becomes less attainable (Gaba and Meyer 2008; Still and Strang 2009). Thus, scholars have pointed out the need for a more balanced focus incorporating the social processes underlying the diffusion phenomenon; in Sorensen's (1998) words, "*fascination, if not an obsession, with statistical models and concerns, and a neglect of the need to develop sociological models mirroring conceptions of mechanisms of social processes*" has led to models with "*a conceptually meaningless list of variables preventing any kind of substantive conclusion*" (p. 243). By moving the focus from just finding correlations among variables towards the often understudied mechanisms of IT diffusion and their underlying synergetic patterns, the literature review framework proposed in the first part of this paper departs from this so called "statistical fetishism" (Davis 2010) and illustrates new potential approaches for tracking the diffusion of IT among organizations.

In the second part of the paper, we propose a typological theory of IT adoption. Our work incorporates both *techno-economic* and *social* factors and reconciles elements from two parallel streams of research on diffusion of innovations. On one hand, strategic and organizational decision making literature portrays managers as rational actors who can access the necessary information about an innovation and make appropriate adoption decisions. On the other hand, institutional theory –at least in its strong form- contends that managers pay the most attention to what innovations others firms adopt - while not caring much about the consequences of adoption for their own organization. Both of these streams have been criticized for projecting either an "over-rationalized" or "under-rationalized" image of the organizational decision makers (Strang and Macy 2001; Powell and Colyvas 2008). In our theory development effort, we seek

to incorporate the implications of these two supposedly contradictory views into our typology of IT adoption decisions.

The rest of this manuscript is structured as follows: First, the scope of the literature review and the utilized methodology is outlined. Then, we put forward a conceptual framework that is emerged from our reading of the extant IT innovation studies. The framework lays the ground for our theory building exercise in the subsequent section. Finally, the paper concludes with a discussion of the implications of our study and avenues for future research in this area of inquiry.

Scope and Methods for the review

Our review encompasses conceptual and/or empirical research articles examining the diffusion of organizational (and interorganizational) level IT innovations. Based on our literature review, several definitions for organizational IT/IS innovation have been proposed (see Table 1).

Table 1 Conceptual Definition of Organizational IT innovation

Definition of Organizational IT Innovation	Source
Innovation in the organizational application of digital computer and communications technologies	Swanson (1994)
The creation and new organizational application of digital computer and communication technologies	Lytinnen and Rose (2003)
The pursuit of IT applications new to an organization	Swanson and Ramiller (2004); Wang and Swanson (2007); Wang (2009)
The generation and development of new ideas or organizational behaviors related to IT	Patrakosola and Olsonb (2007)
The overall process of initiation, adoption, and implementation of new information technology to improve organizational performance	Lee and Kim (1998)

In this paper, we base our conceptualization of IT innovation on Swanson and Ramiller's (2004) definition, i.e. "the pursuit of IT applications new to an organization". This definition permits considering even laggards and late adopters as innovators, and we embrace this aspect of the

definition. However, in this study we extend the scope of Swanson and Ramiller's (2004) definition to encompass organizational practices relevant to IT. Building on Benbasat and Zmud's (2003) model of IT artifact and its nomological net (Figure 1), we define IT innovation as "the pursuit of an IT artifact, or an IT managerial/methodological/operational practice new to an organization". Such definition would allow us to include studies that investigate the diffusion of IS standards (e.g., Hovav et al. 2004; Markus et al. 2006; Nickerson et al. 2006; Weitzel et al. 2006), IS development processes and methods, e.g., (Fichman and Kemerer 1993; Gopal et al. 2005), and alike.

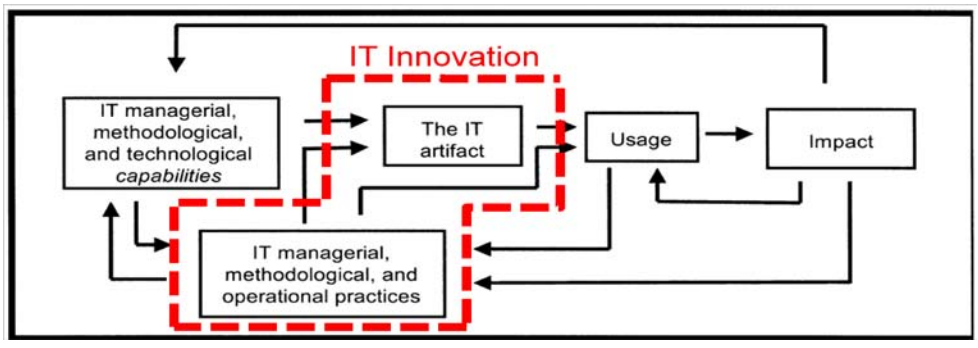

Figure 1 Conceptual scope of IT innovation in IT artifact & its nomological network (Adapted from Benbasat and Zmud 2003)

A rigorous process was followed for review and synthesis of scholarly articles within the scope outlined above. First, we consulted previous reviews (Fichman 1992; Prescott and Conger 1995), and meta analyses (Jeyaraj et al. 2006) – however, unlike the latter, our set is not restricted to the empirical studies nor to the variance models. Second, using electronic databases such as ABI/INFORM and Science Citation Index we searched article abstracts for combinations of phrases such as ('innovation' OR 'adoption,' OR 'diffusion,' OR 'assimilation,' OR 'infusion,' OR 'implementation,' OR 'use') AND ('information technology,' OR 'information systems'). Following Kappos and Rivard (2008), we included in our search all journals ranked "C" or better by a composite score derived from four studies of IS journals (i.e., Hardgrave and

Walstrom 1997; Mylonopoulos and Theoharakis 2001; Walstrom et al. 1995; Whitman et al. 1999). Such a set would encompass IS journals from the North American as well as the European traditions of IS research (Lamb and Kling 2003). The final list contained 17 journals including the Journal of Information Technology, Information & Management, Management Science, Organization Science, Communications of the ACM, European Journal of Information Systems, IEEE Transactions on Software Engineering, Information and Organization, Information Technology and People, Journal of the Association for Information Systems, Information Systems Research, Journal of Management Information Systems, and MIS Quarterly. Proceedings of selected conferences, i.e. the International Conference on Information Systems (ICIS), and the Special Interest Group on Adoption and Diffusion of Information Technology (DIGIT) Pre-ICIS workshops, were also included in this set.

To make sense out of the initial article set, whenever necessary, we went backward from the bibliographical references of articles identified in the previous step. Also, given the multi-disciplinary nature of innovation stream of research, we followed Webster and Watson's (2002) recommendations, and included articles from outside the IS field, mainly organization theory, and sociology. In particular, we consulted the extant innovation research reviews in other fields (Anderson et al. 2004; Strang and Soule 1998; Wejnert 2002; Wolfe 1994). A total of 48 articles were identified as a result of this process and were synthesized for the current review and theory development essay.

Conceptual Framework

We categorize our study as a theory-generative research synthesis (Markus & Saunders, 2007) in which the theoretical concepts and the framework usually emerge from several iterations of reading and synthesizing the relevant literature. Put simply, in such studies, model comes after an extensive literature review. However, reporting the results in the same order means the

reader should follow a lengthy and often complex review before getting to the major theoretical assertions. Hence, for the purpose of readability and comprehensibility, we follow the more traditional presentation approach of first providing a general preview of the resulting framework before getting to the details of literature review.

Throughout an iterative process of reading and synthesizing the articles, the framework depicted in Figure 2 emerged as a conceptual framework that summarizes our reading of this literature. It also serves as a basis for our theory development effort in the following sections. As explained earlier, our framework seeks to depart from a traditional attention to finding correlations between the rate or extent of diffusion, and a list of predictive variables. Instead, we conducted our review of the IT innovation literature with a particular attention to typological theories which are based on complex, synergistic patterns of relationships and provide a holistic understanding of the phenomenon being examined (Doty & Glick, 1994; Fiss 2011).

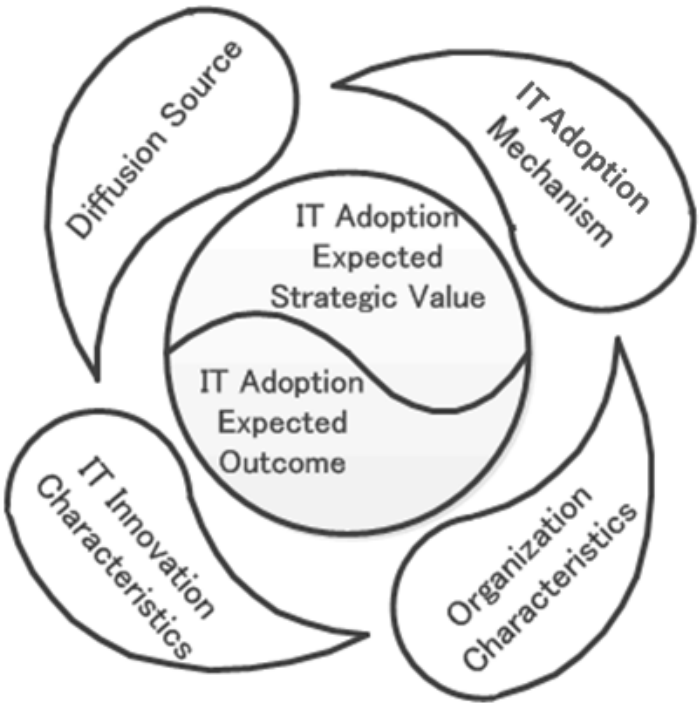

Figure 2. CONCEPTUAL FRAMWORK FOR STUDYING ORGANIZATIONAL IT ADOPTION

Our conceptual framework identifies four core first-order constructs (Fiss 2011), namely, diffusion source, IT adoption mechanism, IT innovation characteristics, and organization characteristics. The synergistic patterns of relationship between these four construct constitute ideal types of IT adoption with specific type of outcome (i.e., substantive vs. symbolic), and level of strategic value (i.e., low vs. high). The conceptual framework implies that different institutional structures (i.e., interorganizational network, third-party knowledge based institutions, regulatory environment) serve as *diffusion sources* for information that trigger the adoption of IT innovations. Organizations receive and use this information for IT innovation adoption through a variety of *mechanisms* (i.e., interorganizational learning, theorization, information-based imitation, rivalry-based imitation, and coercion). At the same time, particular *IT innovation characteristics*, and *organization characteristics* influence the presence and salience of each diffusion mechanism. This framework is the foundation for our proposed typology. In the following subsection, each of the framework components and their manifestations in the IT literature are discussed.

Diffusion Sources

A considerable body of IT innovation studies seek to investigate the sources influential in the diffusion of organizational IT innovations. Based on our review, three main sources can be identified: regulatory environments, interorganizational networks and third-party knowledge based institutions. **Appendix 1** identifies the extant IT studies that provide information about the IT diffusion sources.

From this literature, we observe that sources belonging to the regulatory environment category are usually macro-level institutions such as national governments, or other powerful organizations such as government-affiliated standard making bodies. They typically exert coercive pressure on the adopting organizations (Mezias, 1990; Heugens and Lander 2009).

Sources that belong to the interorganizational network category are typically referred to in studies that adopt network theory as their general theoretical framework. These studies explain the role of different types of interorganizational ties, e.g., arm's length and embedded ties (Uzzi 2003), as well as structurally equivalent firms, in providing information about new IT innovations. Here, it is competition that will play an important force on the adopting organizations. Finally, sources that belong to third-party knowledge-based institutions include IT consulting firms, and business and computer-science schools as the promoters, and sometimes creators, of IT innovation. An emerging stream of research on IT fashions (Baskerville & Myers 2009) and institutionalization of IT innovations examines the role of third-party knowledge based institutions and shows that adopting organizations will most likely be influenced through normative pressures and/or theorization originated from these institutions.

IT innovation studies have investigated the influence of a variety of diffusion sources on adoption decisions. Our model classifies these diffusion sources into the three categories of interorganizational network, third-party knowledge based institutions, and regulatory environment. A close examination of extant research also reveals that different IT innovation diffusion sources can be linked to specific IT diffusion mechanisms. We examine these mechanisms in more details in the following section.

Mechanisms of IT Innovation diffusion

Based on our synthesis of the IT innovation literature, we identified five IT diffusion mechanisms. These include: interorganizational learning, theorization, information-based imitation, rivalry-based imitation, and coercion (see **Appendix 2**). The table provides an overview of the literature and illustrates the link between each of these five mechanism and different diffusion sources involved. The table not only identifies the mechanism involved but also the more detailed micro-processes that are involved. For example, Lai et al (2010) explain

how the traits (e.g. organization size) of early adopters affect the adoption by imitators, while in Soh and Benbasat (2006), it is the success of early adopters with a particular innovation that causes further adoption by imitators; both of these micro-processes can be considered a special case of more general information-based imitation mechanism.

Interorganizational learning

This mechanism occurs when organizational decision makers obtain from current adopters information that reduces ambiguity about the IT innovation. Then, they evaluate the potential benefits of innovation in a rational manner. An IT innovation is adopted to the extent that it appears more effective or efficient than the alternatives.

It has been established in the literature that learning based on sharing of information with interorganizational partners is a key enabler of significant innovations for firms (Powell et al. 1996; Von Hippel 1998). Learning might also take place through other mechanisms of diffusion (e.g., rivalry- or information-based imitation which will be discussed later). However, in those situations, learning occurs at arm's length, leaving the imitator firm with only the observable portions of the other organization's experience. The very fact that the transferred information is articulable (observable) makes it unlikely to create high strategic value for the firm (i.e. such knowledge typically will not be rare, imperfectly traded, or costly to imitate (Spender, 1996). However, with interactive interorganizational learning, a student firm gets in close enough contact with the teacher firm to understand beyond only the objective and observable components of the teacher's engagement with an IT innovation. The student firm will receive privileged and high-quality information about the IT innovation (Author 2008; Malhotra et al. 2005; Uzzi and Lancaster 2003), and will also learn more tacit elements (i.e., the 'how and why' knowledge) (Lane and Lubatkin 1998).

In sum, through interorganizational learning, decision makers gain more specific knowledge about the innovation. This additional knowledge is expected to allow them to make a more informed decision about the appropriateness of adopting the innovation and thus help them foresee the consequences of adopting the innovation.

Theorization

This mechanism occurs when managers adopt IT innovations they perceive as legitimate and effective in solving organizational problems. This perception is influenced by theoretical accounts which simplify and distill the properties of new IT innovations and explain the outcomes they produce (Strang and Meyer 1994).

Most of the extant models of diffusion differentiate between two main stages of an IT innovation diffusion: the early (pre-institutionalized) stage, and the late (institutionalized) stages. However, these two-stage models have been criticized for not clearly explaining what happens in between the two phases (Greenwood et al., 2002; Strang and Macy, 2001; Tolbert and Zucker, 1996). In other words, they cannot explain how an inefficient innovation -or one with suboptimal efficiency- can reach a "critical mass" of early adopters (after which the diffusion process would be driven mainly by imitation forces). Strang and Meyer (1994) introduced the notion of "theorization" as the missing link between pre-institutional stage (where a limited number of organizations innovate locally to address their perceived problems), and full institutionalization of an innovation. Theorization is defined as "*the self-conscious development and specification of abstract categories and the formulation of patterned relationships such as chains of cause and effect*" (Strang and Meyer 1994, p. 492).

Such a theoretical account provides a simplified and distilled explanation of the properties of new innovation, and explains the outcomes it produces. This, in turn, is expected to have an

influence on managers' perception of the legitimacy of the innovation, and hence, facilitate the diffusion of the innovation.

Information-based imitation

Often referred to as "information cascades", "herding behaviour", "observational learning", or "social learning" (Banerjee 1992; Bikhchandani et al. 1992, 1998; Walden and Browne 2009), information-based imitation pertains to situations where an organization observes the actions of other organizations and follow their behaviour without regard to his own information (Bikhchandani et al., 1992). In this process, an organization follows others that are perceived as having superior information. This mechanism takes place in uncertain and ambiguous environments where managers cannot assess the link between innovation adoption decisions and outcomes with great confidence. Indeed, IT innovations are among the most complex technological artifacts (Walden and Browne 2009) and there is an inherent uncertainty and impact time lag associated with implementing them in organizations (Brynjolfsson and Hitt 1996). Therefore, information-based imitation is a common mechanism of diffusion for organizational IT innovations.

Most of the IT diffusion studies that have examined information-based imitation mechanism are either conceptual pieces (Li 2004), or simulation studies (Chang et al. 2010; Oh and Jeon 2007; Walden and Browne 2009). For example, Walden and Browne (2009) use computer simulation to propose a model of technology adoption based on Information-based imitation. In their model, adoption occurs in a sequential manner so as each adopter can see the adoption decision of all preceding entities in the sequence. Yet, the model adds to the literature on herding behaviour by adapting it to the IT innovation diffusion context and by incorporating the notion of probabilistic private signals drawn from a distribution as opposed to binary signals (as in Bikhchandani et al. 1992).

In the case of information-based imitation, it therefore appears that decision makers assume the innovation will have positive outcomes for the organization simply because others have adopted it. The adoption decision is thus made despite the fact that no objective information truly supports it.

Rivalry-Based Imitation

This mechanism occurs when an organization follows other organizations in order to mitigate competitive rivalry or risk. In other words, with the IT adoption decision, the organization tries to maintain its relative position in the market or to neutralize the aggressive actions of competitors (Liberman and Asaba 2006)

Unlike the other type of imitation described above, in this mechanism, organizations' actions do not necessarily convey information. The mechanism takes place in situations of intense competition. In these conditions, when facing with a rival's decision to adopt an IT innovation, organizations can either pursue a strategy of differentiation or homogeneity (Baum & Haveman, 1997; Deephouse, 1999). The differentiation strategy is typically a "high risk, high potential" option, while pursuing a homogenous strategy keeps the organization at par with its rival. Such an approach will ease the severity of competition and keep "competitive parity" among the rivals (Lieberman & Asaba, 2006). In this situation, decision makers are reacting to the competitive forces of the environment. The decision to adopt the innovation is seen as unavoidable for the survival of the organization. Alike information-based imitation, the decision is therefore not based on objective information.

Coercion

The mechanism occurs when more dominant trading partners in an interorganizational network, influential parent organizations, or powerful organizations outside a group of rival organizations

(e.g. standard making bodies, state, or other regulatory entities) forces the adoption of an IT innovation. This mandate for adopting an innovation can be best described by the notion of coercive pressures in neo-institutional theory (DiMaggio and Powel 1983; Zucker 1983). According to this theory, organizational actors choose to give in to institutional pressures, and adopt practices -regardless of their immediate efficiency - aiming at gaining legitimacy. This adoption decision in turn guarantees their long-term survival in their environment (Meyer and Rowan 1977).

As shown in **Appendix 2**, several studies have shown the presence of Coercion mechanism that mandate IT innovation adoption. For example, in case of EDI adoption, powerful trading partners such as General Motors and Ford Motor Company did specify EDI adoption as a requirement for their dealers (Webster 1995), or parent organizations set the rule for their geographically dispersed subsidiaries to implement EDI (Teo et al. 2003). It appears that in the case of Coercion, external powerful forces constrain decision makers to adopt the innovation. Therefore, the decision makers' input in the actual decision to adopt – or not – the IT innovation is extremely limited.

Organizational and IT Innovation Characteristics

In extant IS/IT research, a large body of IT diffusion studies focuses on identifying the organizational, environmental and IT innovation characteristics that will facilitate the adoption of IT innovations. These studies have, over time, formed the basis of a dominant paradigm in the IT innovation stream (Fichman 2004; Jeyaraj et al. 2006). In a nutshell, this stream of research ultimately implies that the existence of a greater number of appropriate independent variables leads to a greater number of IT innovation adoptions (see **Figure 3**).

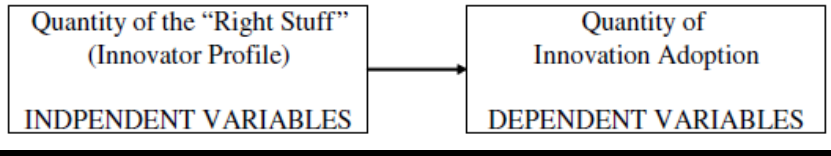

Figure 3 Traditional Paradigm in IT innovation Research (Fichman 2004)

The studies that have looked at the link between an innovator profile characteristics (either perceived or objectively measured) and IT innovation adoption have typically adopted a deterministic approach and sought to identify the best predictors of IT innovation adoption. Overall, these studies have resulted in a long list of independent variables that have not been truly integrated in a nomological net. Therefore, this stream of research has not yet fully contributed to the development of a theoretical explanation for innovation adoption (Gaba and Meyer 2008; Still and Strang 2009).

At the organizational level, three categories of factors have been identified as being significantly related to IT innovation adoption: the environmental characteristics, the organizational characteristics and the IT innovation characteristics. In our conceptual framework (see Figure 2) we model the IT innovation and the organizational characteristics as influential in facilitating or hindering the flow of the diffusion mechanisms. However, the environmental constructs and variables, such as external pressure (e.g. Iacovou et al., 1995), competition (e.g. Grover, 1993), and coercive influence (e.g. Neo et al.,1994), that have been associated with IT innovation adoption are already captured through the sources and mechanisms of IT innovation adoption. This approach is consistent with Jeyaraj et al.'s (2006) meta-analysis results which find a weaker direct impact of environmental characteristics on organizational IT adoption.

In our review of the literature, we identified a large number of studies (see **Appendix 3**) that have examined the link between organizational characteristics and IT innovation adoption. Of those, organization size and slack are the most cited determinants of innovative behavior.

With regard to IT innovation characteristics, **Appendix 4** provides a list of the characteristics that have been identified as predictor of IT innovation adoption. The most commonly cited IT innovation characteristics are relative advantage, and complexity. These two characteristics respectively express the expected outcome and effort associated with implementing a new IT.

Overall, our review identifies a long list of IT innovation characteristics and organization characteristics employed in extant diffusion models. However, we try to depart from the dominant paradigm which assumes a deterministic statistical relationship between the magnitude of these variables and the diffusion of IT innovations. Our theoretical approach looks for viable configurations of IT innovation and organization characteristics that result in distinct types of IT adoption. The most pertinent of these characteristics are identified and will be later employed in the typological theory building exercise of this paper.

Developing A Typological Theory of IT Innovation Adoption

Historically, one of the main goals behind innovation studies has been to develop a general theory of innovation (Downs and Mohr 1976). However, extreme variance and inconsistency in research findings (explained above) portrays such end unreachable. Even for an attribute such as organization size, whose positive impact on innovativeness have been labelled the "most consistent" (Fichman 2000; Rogers 2003), there seems to be mixed empirical findings (Goode 2001). In addition to this problem, there are certain theoretical biases inherent in the currently dominant paradigm of innovation research (Fichman 2004a), e.g. the pro-innovation bias (all adoptions are beneficial) and the rational bias (adopting decisions are rational). These biases make the dominant paradigm inept at explaining either the diffusion of supposedly inefficient innovations or the "hype like" diffusion patterns – which seem to be fairly common for several organizational IT innovations (Fenn and Raskino 2008; Wang 2006).

Our theory development approach to account for this empirical inconsistency and overcome the theoretical limitations is to propose a set of mid-range theories which position in-between substantive (the most specific) and formal (the most grand level) theories. Employing such mid-range theories in IT innovation research can potentially reconcile seemingly paradoxical findings in different contexts. This would also resonate well with Lucas et al.'s (2007) observation that, in IT innovation research, we "*still lack a unifying theory, or even a small assemblage of sub-theories that complement each other*" and their call for developing such theories within the IS field. A typology seems to be a promising candidate for such purpose as it by definition incorporates several mid-range theories (Doty and Glick 1994). As will be explained in the following sections, we seek to propose a typological theory of IT innovation adoption that can potentially address the abovementioned empirical and theoretical confusion. Our approach depicts theoretically meaningful typifications of IT innovation adoptions by organizations. The outcome would be conceptually straightforward –but not overly simple- types of IT adoption, along with their causes and effects. This can then be used in further theory building (e.g., for specific types of IT innovation) and guide future empirical studies.

The terms classification scheme, taxonomy, and typology have often been used interchangeably within the IS literature –and in social sciences in general. In a seminal piece published in Academy of Management Review, Doty and Glick (1994) sought to shed light on the specific characteristics of a typology and illustrated how it can be employed as a theory building tool. According to them, classification schemes and taxonomies are "*classification systems that categorize phenomena into mutually exclusive and exhaustive sets with a series of discrete decision rules*", while Typologies are "*conceptually derived interrelated sets of ideal types*" (p. 232). Unlike the formers, there are no decision rules in a typology for classifying different phenomena. Instead, it identifies several *ideal types*, each of which represent a unique combination of certain characteristics (first-order constructs) that are hypothesized to determine

the relevant outcome. Gregor (2006) embraces this distinction by categorizing taxonomies/classifications as Type I theory (theory for analyzing), and typologies as Type II (Theory for Predicting) or Type IV (Theory for Explaining and Predicting). As will be explained in the next section our theory would tap into the Type IV of Gregor's (2006) classification.

In order to qualify as a theory, a typology should have two distinct kinds of constructs (Doty and Glick 1994). First are the "ideal types", i.e. "*complex constructs that can be used to represent holistic configurations of multiple unidimensional constructs*" (Doty and Glick 1994, p. 233). Unlike classification schemes which could be empirically derived, ideal types of a typology are theoretically driven and "*are more than anything products of inspired synthesis and a strong sense of conceptual esthetics*" (Miller 1996). The second kind of constructs in a typology are the dimensions, aka first-order constructs. Developing a typological theory starts with identifying the dimensions deemed influential in forming an ideal type. Dimensions are conceptually derived and are based on researchers' grasp of the literature. Based on our synthesis of the IT innovation studies, we propose 5 dimensions as building blocks of the ideal types (see Table 2)

Table 2 First-order constructs constituting the ideal types

1st Order Construct	Definition
IT Adoption Mechanism	The processes that account for causal relationships among variables (Davis and Marquis 2005; Pollock et al 2008)
Diffusion Source	The entity from which information about an IT innovation is communicated to the adopting organization (Rogers 1983)
Organizational Attribute(s)	
Recent Performance (relative to aspiration level)	Organization's performance compared to its aspiration level, i.e. the smallest outcome that would be considered satisfactory (Greve, 1998)
IT Innovation Attribute(s)	
Radicalness (Low/High)	The degree to which the innovation departs significantly from existing alternatives and is shaped by novel, cognitive frames that need to be deployed to make sense of the innovation (Lyytinen & Rose 2005)
Organizing Vision Characteristics	A focal community idea for the application of IT in organizations (Swanson & Ramiller 1997)

For each of the five mechanisms identified earlier (information-based imitation, rivalry-based imitation, interorganizational learning, coercion, and theorization), Table 3 bundles together the dimension values (matching diffusion sources, organizational attributes, and IT innovation attributes) that exhibit the most internal consistency.

Table 3 Configurations of first-order constructs

IT Adoption Mechanism					
Salient Mechanism	Information-based Imitation	Rivalry-based Imitation	Interorganizational learning	Coercion	Theorization
Diffusion Source					
Information Received from	Weak Ties (arm's length partners and distant competitors)	Same Industry (head-to head competitors)	Strong ties in a different Industry (e.g., through board interlocks, common ownership)	Strong ties in supply chain, Regulatory bodies	Knowledge-based institutions (through business discourse)
Organization Characteristic(s)					
Recent Performance	Below Aspiration	Considerably Below Aspiration	Below Aspiration	<varies>	Around or Above Aspiration
IT Innovation Characteristic(s)					
Radicalness	Low	High	High	<varies>	Low
Organizing Vision	<varies>	Rational	Rational	Normative	Emotional
	⬇	⬇	⬇	⬇	⬇
Expected Outcome(s)					
Strategic Value	Low	High	High	Low	High
Performance Type	Substantive	Substantive	Substantive	Symbolic	Symbolic
	Type I	**Type II**		**Type III**	**Type IV**

Like other typological theories (e.g., Mintzberg 1979; Miles and Snow 1978), ours does not propose a direct statistical relationship between the unidimensional constructs (Table 2) and a dependent variable. Instead, it suggests an internal consistency among these dimensions within

an ideal type, and then explains why these internally consistent set of variables leads to particular outcomes for organizations. In other words, our four ideal types of IT Adoption each depict a common "configuration" of mutually supportive elements, and propose that these configurations of first-order constructs represent equally effective patterns in IT adoption (Fiss 2011; Doty et al., 1993). It should also be noted that this typology is constructed to suggest that an organizational IT adoption decision resembles one of these four types more, not to suggest that "the world can be neatly divided into four quadrants" (Henderson & Clark, 1990: 13). Likewise, the importance of these types is not that they are exhaustive but that they constitute meaningful typifications of the IT innovation adoption studied in the literature.

A particular aspect in the typology presented in Table 3, is the proposition of distinct expected outcomes from each of the ideal types. These different outcomes can be best classified by two fundamental attributes; namely, expected type of the performance from the IT adoption decision (substantive performance vs. symbolic performance), and the strategic value expected from adopting the IT innovation (low vs. high). This is consistent with existing typological theories, e.g., according to Miles and Snow (1978), being a prospector, defender, analyzer, or reactor yields dissimilar outcomes (Fiss 2011). Distinguished based on their outcomes, the four ideal types are labelled: IT adoption for Efficiency Increment (Type I), IT adoption for Organizational Transformation (Type II), IT adoption for Compliance (Type III), and IT adoption for Prestige (Type IV) – see Figure 4 in the next page.

The vertical dimension in our typology is the expected outcome of an IT adoption. Following the tradition of institutional theorists and building on recent conceptualizations of organizational performance (Heugens and Lander 2009), we distinguish between two types of performance; substantive performance which refers to the extent to which an organization makes accounting-based profits or increases its overall market value, and symbolic performance which is the extent to which an organization generates positive social evaluations. Measures such as return

on investment (ROI) and return on asset (ROA) are used for the former (Melville et al. 2004), whereas the latter is measured by regulatory endorsement, media endorsement, agency ratings and alike (Deephouse and Carter 2005).

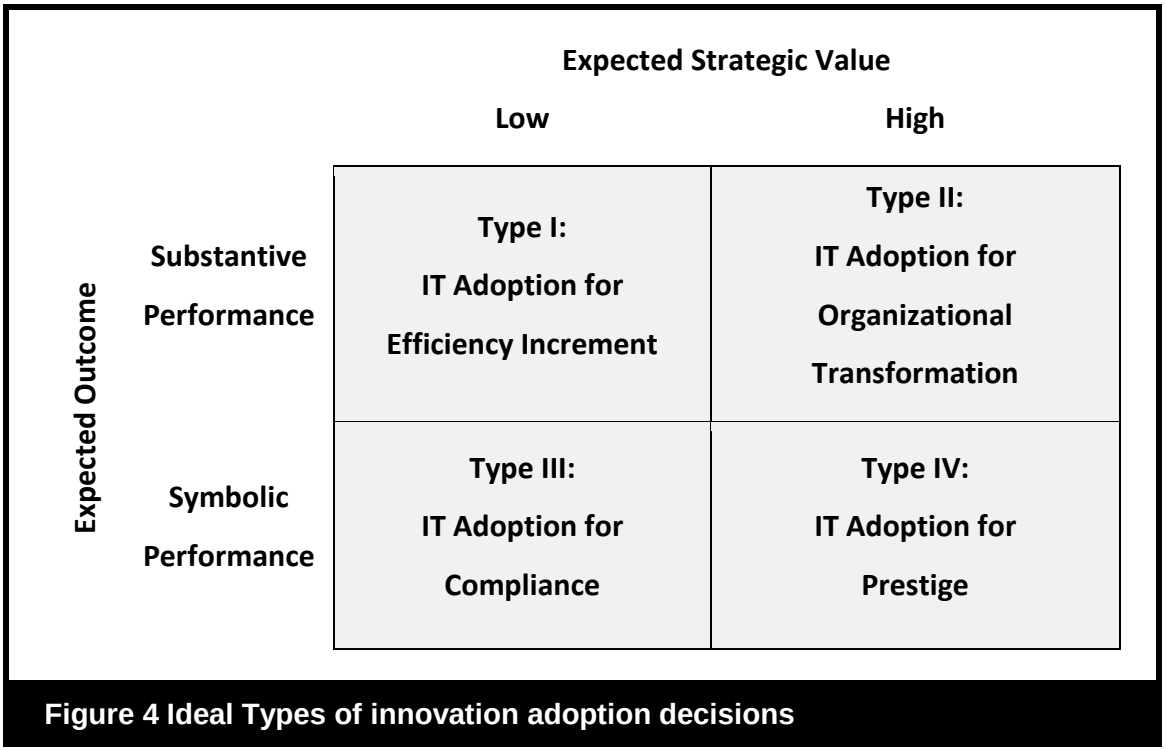

Figure 4 Ideal Types of innovation adoption decisions

The horizontal dimension in our proposed typology is the extent of strategic value expected from adopting an innovation. Within the top row of Figure 4, the distinction between the expected strategic impacts of IT adoption for Efficiency Increment and Organizational Transformation could seem intuitive. Unlike symbolic adoption in which organizations try to "decouple" their technical core from the formally adopted innovation (Zucker 1987), in adopting IT for "substantive performance", the innovation is expected to have an impact on actual organizational activities, aka the technical core. Several organizational attributes, including its current products, markets, technologies, formal structure, and distribution of power, could be affected by such change. Hence, it would be markedly different if the innovation is merely a tweak in the existing technologies, or it is expected to radically change the way an organization

performs (which would potentially transform the current organizational structure, values, and power distribution). Such distinction is inspired by the theory of punctuated equilibrium which portrays organizational evolution as happening in two distinct modes: equilibrium (i.e. relatively long periods of stability) which would be punctuated by revolution (i.e. compact periods of fundamental change) (Gersick 1991). The idea has similarities to Markus's (2004) elaboration on distinguishing between a *technochange*, i.e. technology driven organizational change, and executing *IT projects*. However, in our typology, certain organization-wide IT adoptions could also tap into the Type I quadrant. For example, while implementing an electronic learning system is a corporate-level decision and can bring about cost reduction benefits for the firm (Ong et al. 2004), it typically does not imply a deep organizational change/transformation.

Within the bottom row of our classification (where symbolic performance is desired), the low/high level of expected strategic value can be identified based on the seminal work of Suchman (1995). He distinguishes between institutional processes which happen in a more macro level as the result of the aggregation of different actions of several organizations in a field, and *strategic legitimating actions*, where organizations "*instrumentally manipulate and deploy evocative symbols in order to garner societal support*" (p. 572). Hence, while in the former the organization just acts passively and is influenced by the field level forces, in the latter, the organization plays an active role and expects a strategic value to be realized from its effort. **Appendix 5** provides an alternative representation of Table 3 In the next section we proceed with a description of each quadrant (Types I through IV), and illustrate how these four types are conceptually meaningful, important, and distinct from each other. We also provide examples of IS studies in which IT adoption decision resembles the ideal type of that quadrant.

IT Innovation Adoption Seeking Substantive Performance

The most intuitive reason for an adoption decision is achieving economic returns from using the IT innovation. In this type of adoption decisions, managers are assumed to take economic factors into account in a normatively rational manner, and adopt an innovation if it can efficiently close the performance gap (i.e. a gap between actual and desired performance) in their organizations (Fichman 2004). Within the IS field, a large number of studies have used this logic to examine the spread of technological innovations among organizations. Some examples of these innovations entail Electronic Data Interchange (Iacovou et al. 1995), smart-card payment systems (Plouffe et al. 2001), and Group Support Systems (Dennis and Garfield 2003). However, the logic can be equally applied to study the diffusion of organizational strategies, structures, and administrative techniques (Strang and Soule 1998). While this approach is more prevalent in the fields of strategy and organization, there are a number of IS studies in which have taken a similar approach. For example, Fichman and Kemerer (1992) built on Rogers' diffusion of innovation theory and proposed a framework for assessing the diffusion of Object Oriented methods of software development. Similarly, Riemenschneider (2002) adapted a number of widely used technology adoption models, including Moore and Benbasat's (1996) extension of Rogers (1983), to study the problem of software development methodology acceptance. This category of adoption decisions is classified into the following two types:

Type I: IT Adoption for Efficiency Increment

Adoption decisions aiming at incremental efficiency improvements would result in marginal departure from the current practices of organization (Gopalakrishnan and Damanpour 1997). In the terms of punctuated equilibrium theory, these organizational decisions correspond to "incremental adjustments" performed by systems in equilibrium in order to "compensate for internal or external perturbations without changing their deep structures" (Gersik 1991). An

example of examining such IT innovation adoptions is Sharma et al.'s (2008) case studies of three IS implementation initiatives (i.e. relatively simple applications to be used in Human Resources and Financial departments of a Health Services organization).

As illustrated in Table 3, when firms are engaged in this type of IT innovation adoption, vicarious learning is the more effective approach since direct learning typically demands considerable organizational resources and incurs unnecessary opportunity costs to the adopting organization. Because of the non-strategic nature of these IT adoptions, a typical innovation pertinent to this quadrant does not represent a radical change from the current IT systems, is peripheral to the main day-to-day work of the organization, and does not require significant customization.

Based on the discussions on the findings from our review, identification of the first-order attributes, and discussions on information and rivalry based imitation mechanisms, we put forward the following formal proposition:

Proposition 1: IT Adoption for Efficiency Increment is most effective where:

- ***(a) the diffusion mechanism is information-based imitation,***
- ***(b) the focal firm has a performance below or around aspiration level,***
- ***(c) receives information about IT innovation from its weak ties (arm's length partners and distant competitors), and***
- ***(d) the IT innovation is incremental (not radical).***

Type II: IT Adoption for Organizational Transformation

Different organizational processes would be triggered if the innovation is supposed to produce radical changes in the activities of the organization. Classic examples of investigating the fundamental impact of technological innovation adoption on organizational politics, power structures, and activity structures include Markus's (1983) study of Financial Information System (FIS) implementation, and Barley's (1986) CT scanner implementation ethnography. According

to punctuated equilibrium theory, a system posses a “deep structure”, i.e. a set of fundamental choices about (1) the parts into which its units will be organized and (2) the basic activity patterns that will maintain its continued existence (Gersick 1991; Silva and Hirschheim 2007). In the context of organizational change, this deep structure has been defined as being composed of five elements: values and beliefs, organizational strategy, power distribution, organizational structure, and control systems (Guillemette and Pare 2005). IT innovation that induces organizational transformation can be defined as one that includes alteration in more than one of these deep structure elements.

The most important element in this type of IT adoption (shown in Table **3**) is the two-way exchange of detailed and private information about an IT innovation through direct learning from a focal organization’s strong ties. Organizational network theory literature posits that organizations transmit more detail, accurate, and timely information only through socially embedded ties (Gulati and Sytch 2007; Uzzi 1996, 1997) within their interorganizational network. Likewise, as explained earlier, vicarious learning is unlikely to result in high strategic value for the firm, because the observable knowledge typically will not be rare, imperfectly traded, or costly to imitate (Spender, 1996).

Based on the discussions on the findings from our review, identification of the first-order attributes, and discussions on interorganizational learning mechanisms, we put forward the following formal proposition:

Proposition 2: IT Adoption for Organizational Transformation is most effective where:

- ***(a) the diffusion mechanism is rivalry-based imitation***
- ***(b) the focal firm has a performance considerably below aspiration level,***
- ***(c) receives information about IT innovation from a head-to-head competitor in the same industry,***
- ***(d) the IT innovation is radical, and,***

(e) its organizing vision is characterized as rational.

OR

(f) the diffusion mechanism is interorganizational learning

(g) the focal firm has a performance below aspiration level,

(h) receives information about IT innovation from strong ties in a different industry,

(i) the IT innovation is (1) radical, and,

(j) its organizing vision is characterized as rational.

IT Innovation Adoption Seeking Symbolic Performance

The expected outcome from our Types II and IV of IT adoption is an increase in the symbolic performance of an organization. The relationship between substantive performance and symbolic performance is still a source of academic debate. Early institutional scholars have argued a negative relationship between these two: "*Conformity to institutionalized rules often conflicts sharply with efficiency criteria and, conversely, to coordinate and control activity in order to promote efficiency undermines an organization's ceremonial conformity and sacrifices its support and legitimacy*" (Meyer and Rowan 1977: 340-341). At least two justifications can be made for such trade-off between symbolic vs. substantive performance resulted from adopting IT innovation. First, investing organizational resources in symbolic use of IT may result in positive opportunity costs for the organization (i.e., those resources might be used elsewhere to increase the operational efficiency of the organization). And second, ceremonial adoption of IT innovations to please external stakeholders/observers may cause additional burden, new constraints, and disturbances to the informal "backstage" activities of the organization (Heugens and Lander 2009). Just as an example, there are evidence from the literature that adopting IT process improvement techniques such as Capability Maturity Model (CMM) –while can have favorable outcomes for an organization in terms of improving its legitimacy- might have adverse impacts on employees' morale (Ply et al. 2008) and increase the operational costs (see

Akhlaghpour and Lapointe 2008). Likewise, Wang (2006) shows that following IT fashions can have positive legitimacy impacts and, at the same time, a reversing impact on substantive performance. This category of adoption decisions is classified into the following two types:

Type III: IT Adoption for Compliance

This type of IT innovation adoption decisions corresponds to situations where organizational actors choose to give in to institutional pressures, and adopt practices -regardless of their immediate efficacy- aiming at gaining legitimacy, which in turn guarantees their long-term survival in their environment (Meyer and Rowan 1977). There are several evidences from the literature supporting the existence of such forced-selection dynamics behind the diffusion of IT innovations. For example, in the case of EDI diffusion, Lyytinen and Damsgaard (2001) posited that push from powerful actors (e.g. government, industry associations) was the main dominant factor affecting the adoption decision. The firms were forced to either "EDI or DIE!"

In addition to the direct push by powerful organizations (aka, coercive institutional pressures), there are also forces that indirectly mandate the innovation adoption. For example, competitive bandwagon forces might drive an adoption decision, i.e., non-adopters feel the threat of a competitive disadvantage when they observe that most of their rivals have adopted an innovation. Hence, in order to avoid the risk that this innovation might be potentially used by their competitors to gain an edge, they too adopt it although they perceive it not beneficial to their substantive performance at the moment. As evident in Table 3, when adopting IT innovation for compliance, firms do not engage in direct learning, since they typically have to adopt the IT innovation based on a predefined set of standards (Westphal et al. 1997). Thus, there is little opportunity for customization of this inflexible IT innovation.

Based on the discussions on the findings from our review, identification of the first-order attributes, and discussions on coercion mechanisms, we put forward the following formal proposition:

Proposition 3: IT Adoption for Compliance is most effective where:

- ***(a) the diffusion mechanism is coercion***
- ***(b) the focal firm receives information about IT innovation from strong ties in its supply chain, or regulatory bodies, and,***
- ***(c) the IT innovation's organizing vision is characterized as normative.***

Type IV: IT Adoption for Prestige

Unlike the "compliance" type of innovation adoption, where giving in to institutional pressures and norms will likely result in a rather homogenous adoption of an IT innovation in an organizational field, there are certain other adoption decisions which are made to mainly differentiate a particular organization from the rest of its neighboring organizations. As put by Fenn and Raskino (2008: 72) , many early technology implementation decisions are "*driven as much by the desire to be* ***seen*** *to be innovative as by the expectation of more quantifiable business objectives*".

Signaling theory suggests that when parties in an exchange experience conditions of information asymmetry (i.e., when information about an exchange is distributed unequally), they provide signals that help reduce such asymmetry (Rindova et al. 2006). Adopting certain IT innovations could very well serve as a signal revealing "*information about otherwise* ***hidden*** *[emphasis added] organizational attributes and behaviors*" (King et al. 2005). For example, in the context of IS development, a software vendor in India might adopt a well-known process improvement framework such as CMM in order to send a signal about the quality of its development processes to the potential customers in North America. Without adopting such an

innovation, the Indian firm would not have had much chance to be considered by North American clients as they had virtually no means to verify its capabilities. Hence, the “strategic” adoption decision would noticeably reduce the abovementioned information asymmetry resulted from large geographical distance (Akhlaghpour and Lapointe 2008).

Besides the potential signaling opportunities, this type of adoption decisions can also be attributed to socio-psychological motives of managers, e.g. managers’ desire to appear individualistic and progressive, and their desire to distinguish their organization from lower reputation organizations. According to management fashion theory (Abrahamson 1996; Abrahamson and Fairchild 1999), just as an aesthetic fashion serves to discriminate between high- and low-status individuals, a management fashion can distinguish a high-reputation, more successful, or wealthier organization from others. In other words, adopting a fashionable innovation might do little to boost the performance of the organization, but it will fulfill the function of maintaining the higher prestige of an organization.

Within the realm of individual IT innovation adoption, Moore and Benbasat (1991) introduced a new construct of “Image” to the diffusion models. They defined it as "*the degree to which use of an innovation is perceived to enhance one's image or status in one's social system*". The same rationale can be extended to organizational IT innovations. For example, Fenn and Raskino (2008) explain how adopting Microsoft’s surface touch-screen coffee table computer brought about huge publicity (including being mentioned in the New York Times and Wall Street Journal) for the adopting organization, Starwood Hotels.

As shown in Table 3, firms typically engage in this type of IT adoption when their recent performance surpasses their aspiration level. In their seminal work on the behavioural theory of the firm, Cyert and March (1963) introduced the concept of slack search which occurs when the firm has achieved its aspiration level of performance. They posit that in this situations

organizations tend to assign their excess resources to “slack search”, which is looking for those type of innovations “*that would not be approved in the face of scarcity*” (Cyert and March 1963, p. 279). Building on this “theory of slack search and innovation” (Argote and Greve 2007), we propose that in IT adoption for prestige, when firms possess slack and they face a less turbulent environment, they use this slack to “*develop new products, technologies, or practices even when they are not solving specific problems*” (p. 339).

Based on the discussions on the findings from our review, identification of the first-order attributes, and discussions on theorization mechanisms, we put forward the following formal proposition:

Proposition 4: IT Adoption for Prestige is most effective where:

- ***(a) the diffusion mechanism is theorization***
- ***(b) the focal firm has a performance around or above aspiration level,***
- ***(c) receives information about IT innovation from knowledge-based institutions (through business discourse),***
- ***(d) the IT innovation is incremental (not radical), and,***
- ***(e) its organizing vision is characterized as emotional.***

Finally, our last proposition builds upon the previous four and reiterates the basic premise of a typological theory that deviation from the ideal types leads to inferior results (Doty et al. 1993; Fiss 2011):

Proposition 5: The less the IT innovation adoption characteristics stray from an ideal type, the more effective the IT innovation adoption.

Discussion and Conclusion

This paper provides an account of the IT innovation diffusion literature with a focus on an arguably understudied area of inquiry, i.e. the ideal types of IT adoption. Given the power of typologies as "a unique form of theory building" (Doty and Glick 1994), we developed a typology of IT adoptions based on the results of our literature review. In our proposed typology, the four ideal types are formed based on the values for a number of dimensions, namely, IT adoption mechanism, diffusion source, organizational characteristics (recent performance), IT innovation characteristics (radicalness, and organizing vision characteristics). These ideal types are expected to produce different outcomes in terms of performance type (substantive performance vs. symbolic performance), and strategic value expected from adopting the IT innovation (low vs. high). Based on their expected outcomes, the identified four ideal types are: IT adoption for Efficiency Increment (Type I), IT adoption for Organizational Transformation (Type II), IT adoption for Compliance (Type III), and IT adoption for Prestige (Type IV).

Our identification of ideal types of IT innovation adoption was mainly guided by a thorough synthesis of the published academic articles addressing the diffusion of IT innovations among organizations. In particular, we took into consideration the often understudied (Lucas et al. 2007) elements of technological, institutional, and historical context described in such studies. We also examined relevant innovation diffusion studies in other academic fields. In identifying the ideal types of IT innovation adoption, we tried not to be prejudiced by the sheer volume of studies taking a certain stance, but to look for the theoretical appeal and novelty of proposed arguments. For example, despite the paucity of studies addressing the applications of management fashion theory (Abrahamson 1996; Abrahamson and Fairchild 1999) in IS, those studies (e.g., Baskerville and Meyer 2010; Newell et al. 1998; Swanson and Ramiller 2004;

Wang 2006; Wang 2009) played a major role in providing novel and interesting venues for classifying IT adoption decisions (see for example, the section on IT adoption for prestige).

This review and theory development paper can provide a number of contributions to the IT innovation stream of research. Firstly, our approach in this paper sought to address recent calls to consider alternative perspectives and depart from this dominant paradigm which over time has sustained in this stream. In addition to all of its theoretical limitations and inherent biases (explained earlier), the dominant paradigm may also have reached a point of diminishing returns in terms of its capacity to continue generating interesting and innovative insights (Fichman 2004). In this review, we adopted an institutional view -which itself is relatively new to IS (Mignerat and Rivard 2009; Swanson and Ramiller 2004) and tried to identify the major ideal types of IT innovation adoption. This helps in opening up the black-box of IT adoption decisions by showing how conceptually distinct different IT adoption types are, and elucidating their process characteristics. This can help IT diffusion researchers to make sense of the often paradoxical findings of the current literature in the dominant paradigm, address its limitations (e.g. in explaining faddish cycles of IT adoption), and broaden our understanding of diffusion of IT innovations - especially the organizational-level IT innovations which are understudied in IS (Lucas et al. 2007).

Secondly, our typological theory can pave the way towards extending the contemporary theories of innovation diffusion. The extant models mainly distinguish between two types of adoption decisions. According to these models, in the early stages, managers take a rational perspective and make their adoption decision by considering calculative efficiency-based factors. Yet as time passes, imitation and symbolic aspects will eventually replace the rational and technical ones. For example, in their diffusion models, Rogers (2003) and Bass (1969) discuss “S-curves” that differentiate between early adopters (innovators) and late adopters (imitators). Similarly, new institutional theory posits that unlike early adopters who follow their local rationality, late

adopters of an innovation will only conform while preserving their technical core through buffering (Powell and DiMaggio 1991; Tolbert and Zucker 1983). However, critiques have raised questions regarding the comprehensiveness of the image depicted by these two-stage models, e.g. they cannot explain why an inefficient innovation or one with suboptimal efficiency reaches the "critical mass" stage - after which the diffusion process is driven mainly by imitation forces (Strang and Macy 2001). By identifying and explaining four conceptually distinct ideal types, our typology seeks to go beyond these two-stage models, and portray a more comprehensive image of different rationales behind innovation adoption decisions. This can facilitate further theory development in this area of inquiry.

Thirdly, the typical approach in IT diffusion research is to identify a set of direct antecedents of innovation and use them as independent variables in a variance model (Jeyaraj 2006). Such a model posits that the higher the weighted sum of an organization's score on these variables, the higher the level of the dependent variable (i.e., which is usually some measures of innovativeness such as propensity to adopt an innovation, or the extent of assimilation). The implicit assumption behind these variance models is a simple "more is better" logic (Fichman 2004; Markus and Robey (Fichman 2004a; Fichman 2004b; Markus and Robey 1988) which has its own drawbacks:

> "*One limitation of the dominant approach is that it does not allow for* complex *interactions among the factors that go beyond simple* ***linear additive (or multiplicative)*** *effects. In particular, there may be theoretical contexts where what matters is the* ***holistic configuration*** *of factors that are present or absent.*" (Fichman 2004: 321, emphasis added).

Following the recommendations of Fichman (2004), our approach to address this limitation was to employ typologies as powerful theory building tools that allow for moving beyond traditional linear or even interaction based (i.e., contingency) models. Unlike traditional models in the dominant paradigm which assumes that relationships remain consistent across IT adoptions, typological theories "*explicitly define multiple patterns of the first-order constructs that determine*

the dependent variable. Within an ideal type, the configuration of these constructs is hypothesized to have a synergistic rather than an additive effect" (Doty and Glick 1994: 244). Moreover, different ideal types can portray different combinations of first-order constructs that result in higher levels of the dependent variables, i.e., using information from a focal organization's weak ties through information-based imitation could be very effective in IT adoptions that resemble ideal type I (IT adoption for efficiency increment), while using the same combination of diffusion source and adoption mechanism could lead to failure if the IT adoption is intended for organizational transformation (Type II). As such, by capturing the complex multidimensional *patterns* of innovation-related attributes, ideal types can incorporate the "*holistic* configurations *of factors*" (as called for by Fichman 2004) into a typological theory of innovation:

> "*Using ideal-type constructs allows the theorist to represent synergistic effects that result from the consistency among the* first-*order constructs used to describe each ideal type. These complex synergistic effects incorporated in typologies cannot be represented with only the additive or interactive effects incorporated in more traditional theories*" (Doty and Glick 1994: 244).

Finally, our study can have methodological contributions as well. While in other area of social science, there are a number of seminal theories expressed in terms of typologies (e.g., Mintzberg's (1979), Miles and Snow's (1978), Porter (1980)), the full potential of typologies as theory development tool for IS has yet needs to be exploited. There has been valuable theoretical contributions by a number of articles identifying different types of certain phenomena in IS literature, e.g. Swanson's (1994) six types of IT innovation, Markus's (2001) four types of knowledge reuse situations, Rivard and Lapointe's (2011) taxonomy of managing resistance. However, it seems – based on the specific definitions proposed by Doty and Glick (1994)- that most of these studies tap into the "classification" category as they identify mutually exclusive types based on certain decision rules. According to Gregor's (2006) theory taxonomy, while the aforementioned studies resemble the Type I (Theory for Analyzing), our proposed typology

seeks to be of Type IV (Theory for Explaining and Predicting). Hence, building a typology of IS innovation adoption not only responds the recurrent quests for original theory development in IS (see for example, Grover et al. 2008; Markus and Saunders 2007), it could also bring methodological contributions to the field by introducing and applying a new theory-development approach. Employing typologies provide certain advantages for an IS theory; in addition to enabling the inclusion of complex synergetic interactions, and modeling holistic configurations (explained earlier), in terms of its causal structure (Markus and Robey 1988), a typology intrinsically embodies the notion of equifinality (Doty and Glick 1994), i.e., how different paths can result in a similar outcome (e.g. effective IT adoptions). Allowing for this complex causal structure can lead to richer IS theories. Finally, since the ideal types are mainly derived from theoretical arguments, they enable researchers to go beyond the limitations of the current empirical settings, and to possibly propose normative prescriptions, e.g. with regard to effective strategies for choosing the right innovation at the right time.

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Appendix 1. IT innovation diffusion sources as reflected in the IT literature						
Diffusion Source	**Manifestation**	**Author(s)**	**Year**	**Journal**	**Innovation**	**Process**
Interorganizational Network	Organizational Ties	Bala and Venkatesh	2007	ISR	Interorganizational Business Process Standards	- Relational mechanisms (specificity, depth, extendibility) - Influence mechanism
	Organizational Ties	Benders et al	2006	I&M	Sticking to standards; technical and other isomorphic pressures in deploying ERP-systems	- Mimicing Competitors' Actions
	Organizational Ties	Khalifa & Davison	2006	IEEE trns. on Eng. Mgm.	Electronic Trading System	- Competitors' Mimetic Pressure
	Peers & Competitors	Lai et al	2010	DS	ERP	- Perceived traits (large and successful) of organizations using, Perceived outcomes (benefits achieved) of organizations using - Frquency of adoption (perceived number of organizations using)
	Trading Partner	Chwelos	2001	ISR	EDI	- External Pressure by Trading Partner
	Customers	Khalifa & Davison	2006	IEEE trns. on Eng. Mgm.	Electronic Trading System	- Coercive pressure
	Competitors	Son & Benbasat	2006	JMIS	B2B electronic marketplace	- Competitors' adoption & perceived success - Mimetic Pressure
	Competitors	Chwelos	2001	ISR	EDI	- Competitive Pressure
	Competitors	Ranganathan, Jasbir S. Dhaliwal, and Thompson S.H. Teo	2004	IJEC	EDI	- Competitive Intensity
	Competitors	Wu and Chuang	2010	DSS	eSCM	- Peer Pressure
	Supplier	Son & Benbasat	2006	JMIS	B2B electronic	- Suppliers' perceived

					marketplace	dominance (Coercive)
	Suppliers' adoption	Son & Benbasat	2006	JMIS	B2B electronic marketplace	- Normative Pressure
	Technology Suppliers	Swan et al	1999	OrgStudies	Computer-Aided Production Management (CAPM)	- Interorganizational Learning
	Suppliers	Ranganathan, Jasbir, Dhaliwal, and Teo	2004	IJEC	EDI	- Supplier Interdependency
	Suppliers	Wu and Chuang	2010	DSS	eSCM	- Supplier Interdependence
	Institutional Field	Liang et al	2007	MISQ	Enterprise System	- change in top managers' belief
Third-party Knowledge-Based institutions	Standard making bodies	Benders et al	2006	I&M	Sticking to standards; technical and other isomorphic pressures in deploying ERP-systems	- Industry Norms
	Employees certified by third parties	Khalifa & Davison	2006	IEEE trns. on Eng. Mgm.	Electronic Trading System	- Normative Pressure
	Professional & Trade	Son & Benbasat	2006	JMIS	B2B electronic marketplace	- Normative Pressure
	Best practices	Bala and Venkatesh	2007	ISR	Interorganizational Business Process Standards	- Interorganizational homogenization (normative)
	Consultancies	Swan et al	1999	OrgStudies	Computer-Aided Production Management (CAPM)	- Theorization
Regulatory Environment	Government initiative (eGov strategic plan)	Phang et al	2008	JSIS	Human Resource and Finance Integrated System (HRFIS)	- Coercive Pressure
	U.S. government-funded healthcare programs	Davidson & Chismar	2007	MISQ	Computerized Physician Order Entry (CPOE)	- Coercive Pressure
	State government regulations	Standing et al	2009	I&M	E-marketplace	- Coercive Pressure
	Professional Associations	Swan et al	1999	OrgStudies	Computer-Aided Production Management (CAPM)	- Theorization

Appendix 2. Mechanisms of diffusion of IT innovations as reflected in the IT literature

Mechanism	Author(s)	Year	Journal	Innovation	Diffusion Source	Micro-Processes
Interorganizational Learning (Managers' Perceptions)	Bala and Venkatesh	2007	ISR	Interorganizational Business Process Standards	Interorganizational Network (Organizational Ties)	Relational mechanisms (specificity, depth, extendibility)
	Liang et al	2007	MISQ	Enterprise System	Interorganizational Network (Institutional Field)	Change in top managers' belief
	Lai et al	2010	DS	ERP	Not Reported	Managers' Perceptions
	Swan et al	1999	OrgStudies	Computer-Aided Production Management (CAPM)	Interorganizational Network (Technology Suppliers)	Social contact with technology suppliers
Theorization	Benders et al	2006	I&M	Sticking to standards; technical and other isomorphic pressures in deploying ERP-systems	Third-party Knowledge-Based institution (standard making bodies)	Industry Norms
	Khalifa & Davison	2006	IEEE trns. on Eng. Mgm.	Electronic Trading System	Third-party Knowledge-Based institution (Employees certified by third parties)	Normative Pressure
	Son & Benbasat	2006	JMIS	B2B electronic marketplace	Third-party Knowledge-Based institution (Professional & Trade)	Normative Pressure
	Swan et al	1999	OrgStudies	Computer-Aided Production Management (CAPM)	Knowledge-Based institution (consultants)	Theorization
Information Based Imitation	Bala and Venkatesh	2007	ISR	Interorganizational Business Process Standards	Interorganizational Network (Organizational Ties)	Influence mechanism
	Son & Benbasat	2006	JMIS	B2B electronic marketplace	Interorganizational Network	Competitors' adoption & perceived success -

					(Competitors)	Mimetic Pressure
	Lai et al	2010	DS	ERP	Iterorganizational Network (Peers & Competitors)	Perceived traits (large and successful) of organizations using, Perceived outcomes (benefits achieved) of organizations using
Rivalry-Based Imitation	Benders et al	2006	I&M	Sticking to standards; technical and other isomorphic pressures in deploying ERP-systems	Interorganizational Network	Mimicking Competitors' Actions
	Bala and Venkatesh	2007	ISR	Interorganizational Business Process Standards	Third-party Knowledge-Based institutions (Best practices)	Interorganizational homogenization (normative)
	Khalifa & Davison	2006	IEEE trns. on Eng. Mgm.	Electronic Trading System	Interorganizational Network	Competitors' Mimetic Pressure
	Lai et al	2010	DS	ERP	Iterorganizational Network (Peers & Competitors)	Frequency of adoption (perceived number of organizations using)
	Ranganathan, Jasbir S. Dhaliwal, and Thompson S.H. Teo	2004	IJEC	EDI	Interorganizational Network (Competitors)	Competitive Intensity
Coercion	Phang et al	2008	JSIS	Human Resource and Finance Integrated System (HRFIS)	Regulatory Environment (Government initiative - eGov strategic plan)	
	Benders et al	2006	I&M	Sticking to standards; technical and other isomorphic pressures in deploying ERP-systems	Knowledge-Based institutions (standard making bodies)	
	Bala and	2007	ISR	Interorganizational	Interorganizational	Influence mechanism

	Venkatesh			Business Process Standards	Network (Organizational Ties)	
	Khalifa & Davison	2006	IEEE trns. on Eng. Mgm.	Electronic Trading System	Interorganizational Network (Customers)	Coercive pressure
	Son & Benbasat	2006	JMIS	B2B electronic marketplace	Interorganizational Network (Supplier)	Suppliers' perceived dominance (Coercive)
	Ranganathan, Jasbir S. Dhaliwal, and Thompson S.H. Teo	2004	IJEC	EDI	Interorganizational Network (Competitors)	Supplier Interdependence

Appendix 3. Organizational characteristics influential in innovation adoption as reflected in IT literature

Organizational Characteristic - General Category	Organizational Characteristic	Author(s)	Year	Journal	Innovation
Organization Size	Organization Size	Liang et al	2008	MISQ	Enterprise System
	firm size	Soares-Aguiar & Palma-Dos-Reis	2009	IEEE transactions on Eng. Mgmt.	E-Procurement System
	Org Size	Grover et al	1998	ISR	IS outsourcing, Computer Aided Software Engineering (CASE), Object Oriented Programming Systems (OOPS), large scale relational Data Base Management Systems (DBMS), EIS, teleconferencing, expert systems, and electronic mail, EDI systems
	Org Size	Yan and Fiorito	2007	JFMM	CAD/CAM
	Organizational Size	Ramamurthy et al.	2010	DSS	Data Warehouse
Slack	IS Slack	Grover et al	1999	ISR	IS outsourcing, Computer

					Aided Software Engineering (CASE), Object Oriented Programming Systems (OOPS), large scale relational Data Base Management Systems (DBMS), EIS, teleconferencing, expert systems, and electronic mail, EDI systems
	Org Slack	Grover et al	2000	ISR	IS outsourcing, Computer Aided Software Engineering (CASE), Object Oriented Programming Systems (OOPS), large scale relational Data Base Management Systems (DBMS), EIS, teleconferencing, expert systems, and electronic mail, EDI systems
	Resource Slack	Li et al.	2012	JAIS	Online Direct Sales Channels
Formalization	Formalization on System Development & Management	Chau & Tam	1999	MISQ	Open Systems
	Formalization	Ranganathan, Jasbir S. Dhaliwal, and Thompson S.H. Teo	2006	IJEC	EDI
Dominance in relationships	Dominance in relationships	Bala and Venkatesh	2007	ISR	Interorganizational Business Process Standards
Absorptive Capacity	Absorptive Capacity	Liang et al	2007	MISQ	Enterprise System
Organizational Compatibility	Organizational Compatibility	Liang et al	2009	MISQ	Enterprise System
Time since Implementation	Time since Implementation	Liang et al	2010	MISQ	Enterprise System
firm scope	firm scope	Soares-Aguiar & Palma-Dos-Reis	2008	IEEE transactions on Eng. Mgmt.	E-Procurement System
Tech competence (IT infrastructure, IT expertise,	Tech competence (IT infrastructure, IT	Soares-Aguiar & Palma-Dos-Reis	2010	IEEE transactions	E-Procurement System

B2B know-how)	expertise, B2B know-how)			on Eng. Mgmt.	
Financial Resources	Financial Resources	Soares-Aguiar & Palma-Dos-Reis	2011	IEEE transactions on Eng. Mgmt.	E-Procurement System
Technology Knowledge	Technology Knowledge	Soares-Aguiar & Palma-Dos-Reis	2012	IEEE transactions on Eng. Mgmt.	E-Procurement System
Procedural Flexibility	Procedural Flexibility	Bendoly et al.	2007	DS	RFID
Cross functional knowledge	Cross functional knowledge	Bendoly et al.	2008	DS	RFID
Effective Information Processing Standards	Effective Information Processing Standards	Bendoly et al.	2009	DS	RFID
Organizational Readiness	Organizational Readiness	Quaddus & Hofmeyer	2007	EJIS	B2B trading exchanges
IS Size	IS Size	Grover et al	1997	ISR	IS outsourcing, Computer Aided Software Engineering (CASE), Object Oriented Programming Systems (OOPS), large scale relational Data Base Management Systems (DBMS), EIS, teleconferencing, expert systems, and electronic mail, EDI systems
Tech Diversity	Tech Diversity	Grover et al	2001	ISR	IS outsourcing, Computer Aided Software Engineering (CASE), Object Oriented Programming Systems (OOPS), large scale relational Data Base Management Systems (DBMS), EIS, teleconferencing, expert systems, and electronic mail, EDI systems
Professionalism	Professionalism	Grover et al	2002	ISR	IS outsourcing, Computer Aided Software Engineering

					(CASE), Object Oriented Programming Systems (OOPS), large scale relational Data Base Management Systems (DBMS), EIS, teleconferencing, expert systems, and electronic mail, EDI systems
Strategic IS	Strategic IS	Grover et al	2003	ISR	IS outsourcing, Computer Aided Software Engineering (CASE), Object Oriented Programming Systems (OOPS), large scale relational Data Base Management Systems (DBMS), EIS, teleconferencing, expert systems, and electronic mail, EDI systems
Complexity of IT Infrastructure	Complexity of IT Infrastructure	Chau & Tam	1997	MISQ	Open Systems
Satisfaction with Existing Systems	Satisfaction with Existing Systems	Chau & Tam	1998	MISQ	Open Systems
Quality orientation of the host organization,	Quality orientation of the host organization,	Ravichandran	2000	DS	TQM
IS Org Structure (size, functional differentiation, and structural complexity), IS management support for quality	IS Org Structure (size, functional differentiation, and structural complexity), IS management support for quality	Ravichandran	2001	DS	TQM
Strategic Role of IS	Strategic Role of IS	Ravichandran	2002	DS	TQM
Outsourcing Propensity	Outsourcing Propensity	Ravichandran	2003	DS	TQM
Financial Resources	Financial Resources	Chwelos	2001	ISR	EDI
IT Sophistication	IT Sophistication	Chwelos	2002	ISR	EDI
Trading Partner Readiness	Trading Partner Readiness	Chwelos	2003	ISR	EDI
Managerial IT Knowledge	Managerial IT Knowledge	Ranganathan, Jasbir S. Dhaliwal, and Thompson S.H. Teo	2004	IJEC	EDI

Centralization	Centralization	Ranganathan, Jasbir S. Dhaliwal, and Thompson S.H. Teo	2005	IJEC	EDI
Formalization	Formalization	Ranganathan, Jasbir S. Dhaliwal, and Thompson S.H. Teo	2006	IJEC	EDI
Management Support	Management Support	Macredie & Mijinyawa	2011	EJIS	Open Source Software (OSS)
Core-IT Skills	Core-IT Skills	Macredie & Mijinyawa	2012	EJIS	Open Source Software (OSS)
IT Support	IT Support	Macredie & Mijinyawa	2013	EJIS	Open Source Software (OSS)
Innovativeness	Innovativeness	Macredie & Mijinyawa	2014	EJIS	Open Source Software (OSS)
Internet Expertise	Internet Expertise	Li et al.	2011	JAIS	Online Direct Sales Channels
Risk Propensity	Risk Propensity	Li et al.	2013	JAIS	Online Direct Sales Channels
Technology Anxiety	Technology Anxiety	Pramatari and Theotokis	2009	EJIS	RFID
Information Privacy Concern	Information Privacy Concern	Pramatari and Theotokis	2010	EJIS	RFID
Budget Constraints	Budget Constraints	Mangalaraj et al	2009	EJIS	Extreme Programming
Time Constraints	Time Constraints	Mangalaraj et al	2010	EJIS	Extreme Programming
Organizational Commitment	Organizational Commitment	Ramamurthy et al.	2008	DSS	Data Warehouse
Absorptive Capacity	Absorptive Capacity	Ramamurthy et al.	2009	DSS	Data Warehouse
Organizational Scope for Innovation (DW)	Organizational Scope for Innovation (DW)	Ramamurthy et al.	2011	DSS	Data Warehouse
Organizational Data Environment	Organizational Data Environment	Ramamurthy et al.	2012	DSS	Data Warehouse
Performance Gap	Performance Gap	Lee & Shim	2007	EJIS	RFID
Presence of Champions	Presence of Champions	Lee & Shim	2008	EJIS	RFID

Appendix 4. IT innovation characteristics influential in innovation adoption as reflected in IT literature

Innovation Characteristic - General Category	Innovation Characteristic	Author(s)	Year	Journal	Innovation

Relative Advantage	Perceived Desirability	Khalifa & Davison	2006	IEEE transactions on Eng. Mgmt.	Electronic Trading System
	Relative Advantage	Lai et al	2010	DS	ERP
	Perceived Usefulness	Plouffe et al	2002	ISR	Smart Card
	Relative Advantage	Plouffe et al	2003	ISR	Smart Card
	Relative Advantage	Ramamurthy et al.	2008	DSS	Data Warehouse
	Perceived Benefits	Lee & Shim	2007	EJIS	RFID
	Perceived Direct Benefits	Quaddus & Hofmeyer	2007	EJIS	B2B trading exchanges
	Perceived Indirect Benefits	Quaddus & Hofmeyer	2008	EJIS	B2B trading exchanges
	Perceived Relative Advantage	Slyke	2011	EJIS	Computer-based communication technologies
	Perceived Benefits	Chau & Tam	1997	MISQ	Open Systems
	Perceived Benefits	Chwelos	2001	ISR	EDI
	Relative Advantage	Wu and Chuang	2010	DSS	eSCM
	Relative Advantage	Macredie & Mijinyawa	2011	EJIS	Open Source Software (OSS)
	Perceived Relative Advantage	Li et al.	2012	JAIS	Online Direct Sales Channels
	Performance Expectancy	Pramatari and Theotokis	2009	EJIS	RFID
	perceived importance of standard compliance, interoperability and interconnectivity	Chau & Tam	1999	MISQ	Open Systems
Complexity	Perceived Feasibility	Khalifa & Davison	2006	IEEE transactions on Eng. Mgmt.	Electronic Trading System
	Complexity	Son & Benbasat	2006	JMIS	B2B electronic marketplace

	Complexity	Lai et al	2012	DS	ERP
	Perceived Ease of Use	Plouffe et al	2001	ISR	Smart Card
	Complexity	Ramamurthy et al.	2009	DSS	Data Warehouse
	Perceived Ease of Use	Slyke	2010	EJIS	Computer-based communication technologies
	Perceived Barriers	Chau & Tam	1998	MISQ	Open Systems
	Complexity	Wu and Chuang	2011	DSS	eSCM
	Complexity	Macredie & Mijinyawa	2014	EJIS	Open Source Software (OSS)
	Perceived Ease of Use	Li et al.	2011	JAIS	Online Direct Sales Channels
	Effort Expectancy	Pramatari and Theotokis	2010	EJIS	RFID
Compatibility	Compatibility	Lai et al	2011	DS	ERP
	Compatibility	Plouffe et al	2004	ISR	Smart Card
	Compatibility	Mangalaraj et al	2009	EJIS	Extreme Programming
	Perceived Compatibility	Slyke	2007	EJIS	Computer-based communication technologies
Result Demonstrability	Result Demonstrability	Plouffe et al	2006	ISR	Smart Card
	Perceived Result Demonstrability	Slyke	2008	EJIS	Computer-based communication technologies
Visibility	Visibility	Plouffe et al	2007	ISR	Smart Card
	Perceived Visibility	Slyke	2009	EJIS	Computer-based communication technologies
Compatibility	Compatibility	Macredie & Mijinyawa	2015	EJIS	Open Source Software (OSS)
Reliability	Reliability	Macredie & Mijinyawa	2013	EJIS	Open Source Software (OSS)

Asset Specificity	Asset Specificity	Son & Benbasat	2006	JMIS	B2B electronic marketplace
Image	Image	Plouffe et al	2005	ISR	Smart Card
Triability	Triability	Plouffe et al	2008	ISR	Smart Card
Voluntariness	Voluntariness	Plouffe et al	2009	ISR	Smart Card
Tools Support	Tools Support	Mangalaraj et al	2010	EJIS	Extreme Programming
Ability to Provide Security	Ability to Provide Security	Wu and Chuang	2012	DSS	eSCM
Extensibility	Extensibility	Macredie & Mijinyawa	2012	EJIS	Open Source Software (OSS)
Functionality	Functionality	Macredie & Mijinyawa	2016	EJIS	Open Source Software (OSS)

Expected Outcome	Expected Strategic Value: Low	Expected Strategic Value: High
Substantive Performance	• Rationale: IT Adoption for Efficiency Increment • Recent Performance: Below aspiration level (Schneider 1992) • Salient IT Innovation Characteristics (Rogers 2003; Wolfe 1994): Incremental (as opposed to Radical) • Organizing Vision Characteristics (Swanson and Ramiller 2004): Reasoned, unemotional, and qualified discourse (Abrahamson and Fairchild 1999) • Adoption mechanism (Liberman & Asaba 2006): Information Based Imitation • Diffusion Source: Arm's Length • Example: Adoption of Human Resources and Financial applications in a Health Services organization (Sharma et al. 2008)	• Rationale: IT Adoption for Organizational Transformation • Recent Performance: Considerably below aspiration level (Schneider 1992) • Salient IT Innovation Characteristics (Rogers 2003; Wolfe 1994): Radical (as opposed to Incremental) • Organizing Vision Characteristics (Swanson and Ramiller 2004) : Rational rhetorics (Barley and Kunda 1992) • Interorganizational Attention Source (Still & Strang 2009): Same industry, Rivals • Adoption mechanism (Liberman & Asaba 2006): Rivalry-based imitation • Communication Channel: Same Industry (head-to head competitors) • Example: CT scanner implementation in radiology departments (Barley 1986)
Symbolic Performance	• Rationale: IT Adoption for Compliance • Recent Performance: Below/above aspiration level • Salient IT Innovation Characteristics (Rogers 2003; Wolfe 1994): Interorganizational, Administrative (as opposed to Technical), Network externality • Organizing Vision Characteristics (Swanson and Ramiller 2004): Normative rhetorics (Barley and Kunda 1992) • Adoption mechanism: Coercion • Diffusion Source: Regulatory bodies, Supply chain • Example: EDI Implementation by banks (Teo et al. 2003)	• Rationale: IT Adoption for Prestige • Recent Performance: Above aspiration level (Schneider 1992) • Salient IT Innovation Characteristics (Rogers 2003; Wolfe 1994): Incremental • Organizing Vision Characteristics (Swanson and Ramiller 2004): Fashionable, Emotionally charged, enthusiastic, and unreasoned discourse (Abrahamson and Fairchild 1999) • Adoption mechanism: Theorization • Diffusion Source: Non-relational (business discourse), Arm's Length Prestigious Organizations • Example: Adopting Microsoft's surface touch-screen coffee table by hotels (Fenn and Raskino 2008)

Appendix 5 Alternative representation of four Ideal types in IT innovation adoption

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