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An Analytical Framework to Understand the Adoption of Cloud Computing: An Institutional Theory Perspective

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Abstract: Cloud computing (CC) offers a new information technology service model for organizations. In spite of its possible benefits, however, it also poses some serious concerns. Why do organizations adopt CC in spite of its potential risks? Based on several core concepts based on institutional theory, we propose an analytical framework to better understand the adoption of CC by organizations. We focus on the concepts of field-level changes, organizational fields, institutional isomorphism, and institutional strategic responses within the context of CC adoption. We identify a number of organizations that form the organizational field and bring about changes (i.e., CC providers, peer organizations, business partners, professional and industry associations, and regulators) that may trigger institutional pressures (i.e., coercive, normative, and mimetic) on the adopting organizations. We conclude by presenting possible strategic responses (i.e., acquiescence, compromise, avoidance, defiance, and manipulation) to address the institutional pressures related to CC adoption.

Keywords: cloud computing, institutional theory, adoption, organizational field, institutional isomorphism, strategic responses

1. Introduction

The concept of cloud computing (CC) has received considerable attention in academic and technical literature over the past several years (Timmermans et al. 2010; Yang & Tate 2012). The extant literature reports various benefits that CC may provide for organizations, including simplicity, cost efficiency, reduced demand for skilled labor, and scalability (Armbrust et al. 2010; Venters & Whitley 2012; Garrison et al. 2012). However, the literature also forewarns adopters to pay attention to potential risks associated with the implementation, management, and use of CC services (Marston et al. 2011).

Notwithstanding these potential risks, several sources indicate that the adoption of CC has been growing significantly (Catteddu 2010; Lee et al. 2011; CSA & ISACA 2012). CC offers a compelling solution for small- and medium-sized enterprises (SMEs) due to its low-entry barriers, both technical and financial, for using such sophisticated services. In contrast, large enterprises (LEs) possess surplus resources and can afford to implement an in-house information technology (IT) infrastructure (Weinhardt et al. 2009; Gordon et al. 2010; Son et al. 2011; Li et al. 2012). However, some questions regarding the use of CC have not been clearly addressed in the literature to date. For example, does CC leverage its promises to the adopters, what factors affect the decision to adopt or not to adopt CC, and do these factors affect the way the adopters manage the potential risks and/or exploit the promising benefits?

As a preliminary effort to address these issues, we propose an analytical framework to better understand the process of CC adoption by organizations. As the extant literature pays more attention to the benefits of CC than to its risks, we expect that the framework will be useful for answering the question of, *Why do organizations adopt CC in spite of its potential risks*?

To develop the framework for this study, we have relied on the concept of institutional theory, which is well-suited for gaining a better understanding of the various stages of the IT institutionalization process and the interactions between IT and the institution (Swanson & Ramiller 2004; Mignerat & Rivard 2009). In addition, institutional theory equips us with various concepts for better understanding the impact of internal and external factors on organizations that are engaged in IT-induced changes (Mignerat & Rivard 2009; Weerakkody et al. 2009). The theory is also able to capture the notion of "irrationality" in decision-making processes (Meyer & Rowan 1977; DiMaggio & Powell 1983; Mouritsen 1994), such as when an organization adopts CC to keep up with the industry hype and not just to reduce costs.

The remainder of the paper is structured as follows: In Section 2, we describe the concept of CC, along with its associated benefits and risks. The underlying concepts of institutional theory are presented in Section 3. In Section 4, we develop an analytical framework by connecting the institutional concepts supported with arguments from the extant literature. Section 5 ends the paper with conclusions and possible ways to use the framework in future research.

2. Cloud computing

The CC paradigm has emerged from previous distributed computing technologies such as grid computing and virtualization (Sultan 2011). CC is classified as a form of IT outsourcing through which shared IT resources are pooled in large external data centers and made accessible by users through the Internet (Venters & Whitley 2012). Commonly, CC is defined as "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Mell & Grance 2011, p. 2).

CC services are delivered by the provider to users via various models, such as Software as a Service (SaaS), Platform as a Service (PaaS), and/or Infrastructure as a Service (IaaS) (Mell & Grance 2011). The SaaS model provides Internet-based access to applications created by the CC provider. The PaaS model provides programming languages and tools supported by the CC provider via the Internet to develop and deploy user-created applications. The IaaS model provides computing resources (e.g., processing power, storage, and network).

Further, CC can be deployed in various forms, such as public, private, community, and hybrid clouds (Mell & Grance 2011). A public cloud infrastructure is accessible by the general public and is owned by the CC provider. A private cloud infrastructure is owned and managed by the user/organization. A community cloud is a private one shared by several organizations that have common concerns. The hybrid cloud infrastructure is a combination of two or more private, public, or community clouds that are linked together by standardized technology to ensure data and application portability. In addition to CC providers and users, there are "enablers" or "intermediaries" that manage the relationships between cloud providers and users and that facilitate CC adoption and use (Marston et al. 2011).

Regarding CC adoption, "there are significant technical, operational, and organizational issues which need to be tackled […] at the enterprise level" (Marston et al. 2011, p. 184). Hence, there are two views regarding the emergence of CC—optimistic and pessimistic. From an optimistic viewpoint, CC may bring economic, strategic, and technological benefits to organizations (Garrison et al. 2012). Organizations can increase their productivity and focus on their core business activities due to the decreased need to set-up in-house IT infrastructure, thus saving IT-related capital expenditures while achieving business agility (Ernst & Young 2011; Kepes 2011; Garrison et al. 2012). Since CC services are scalable, they adequately suit different users' needs and environments on a pay-as-you-go subscription basis (Durkee 2010; Mell & Grance 2011). Nevertheless, we cannot neglect the more pessimistic viewpoint that focuses on the potential risks and problems of CC adoption. Commonly identified CC risks are privacy (this includes control over the data, as well as trust, legal, and ethical issues), cultural differences at both corporate and geographical levels, and switching costs resulting from the vendor lock-in problem (Dillon et al. 2010; Ernst & Young 2011; Yang & Tate 2012). To comprehensively evaluate and understand CC adoption by organizations, it is important to look at both the benefits and risks of this process.

3. Theoretical basis

Institutional theory is rooted in the social sciences with contributions from various disciplines including economics, political science, organization science, and information systems (IS)/IT studies (Scott 2004; Currie 2009; Mignerat & Rivard 2009). Regarding IS/IT-related phenomena, it is argued that institutional theory has relevance to "understanding the impact of internal and external influences on organizations that are engaged in […] IT-induced change" (Weerakkody et al. 2009, p. 355). In the context of IS research, many studies have utilized institutional theory to "examine IS/IT-related phenomena exemplified in IT innovation, IS development and implementation, and IT adoption and use" (Mignerat & Rivard 2009, p. 1).

The rationale for choosing institutional theory to construct our analytical framework is twofold: It increases our understanding of "how institutions influence the design, use, and consequences of technologies, either within or across organizations" (Orlikowski & Barley 2001, p. 153) and it captures the notion of irrationality in decision-making through which organizational actors seek legitimacy more than efficiency (Avgerou 2000; Orlikowski & Barley 2001; Mignerat & Rivard 2009). This legitimacy is gained when these actors "accept and follow social norms unquestioningly, without any real reflection" (Tolbert & Zucker 1996, p. 176). In constructing the analytical framework, we focus on several core concepts that are germane to the understanding of CC adoption: field-level changes, isomorphic pressures, strategic responses, and institutional impacts. Each of these concepts is succinctly described below. The relationships among these concepts are depicted in Figure 1.

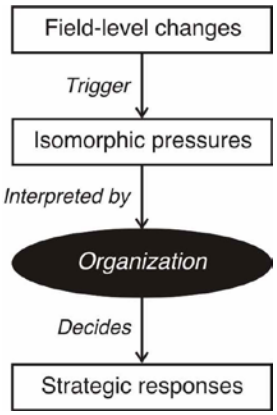

Figure 1: The core concepts

Field-level changes. To obtain acceptance and legitimacy, organizations are required to conform to a set of rules and requirements at the organizational field level (Wooten & Hoffman 2008). The organizational field is defined as "a community of organizations that partakes of a common meaning system and whose participants interact more frequently and fatefully with one another than with actors outside the field" (Scott 2001, p. 84). This may include government, critical exchange partners, sources of funding, professional and trade associations, special interest groups (e.g., industry level), and the general public (Scott 1991). Nonetheless, the concept of an organizational field has been dilated beyond geography and goals to encompass organizations that produce similar services or products (e.g., competitors), consumers, suppliers, and regulatory agencies (DiMaggio & Powell 1983). Changes at this organizational field level trigger various isomorphic pressures to organizations operating in that field.

Institutional isomorphism. At the field level, organizations confront powerful forces (i.e., isomorphic pressures) that cause them to become more similar to one another, thus achieving isomorphism (DiMaggio & Powell 1983). Institutional isomorphism is argued as "a useful tool for understanding the politics and ceremony that pervade much modern organizational life" (DiMaggio & Powell 1983, p. 150).

Institutional isomorphism manifests in three forms (DiMaggio & Powell 1983): *coercive, normative,* and *mimetic*. Coercive isomorphism results from both formal (e.g., regulations) and informal (e.g., culture) pressures exerted on organizations by their legal environment. Normative isomorphism results from pressures exerted by professional associations that define normative rules about organizational and professional behavior. Likewise, universities and professional training institutions produce individuals with similar orientations and educational backgrounds; for instance, an organization might decide to adopt cloud services because its managers learn that cost reduction is a good thing. Mimetic isomorphism results from uncertainties (e.g., goal ambiguity or poor awareness of organizational innovation); organizations are influenced by their competitors in the field and tend to imitate them, expecting similar success. These various isomorphic pressures force organizations to response accordingly and strategically.

Strategic responses. A key theme of institutional theory is that "an organization's survival requires it to conform to social norms of acceptable behavior" (Covaleski & Dirsmith 1988, p. 563). At the *organizational level*, organizations may enact five strategies expressed through tactics to cope with various isomorphic pressures in order to gain, maintain, or repair their legitimacy (Oliver 1991; Suchman 1995). While "early

adoption decisions of organizational innovations are commonly driven by a desire to improve performance" (DiMaggio & Powell 1983, p. 148), as innovations diffuse, the adoption decision becomes driven by the desire to achieve legitimacy rather than to improve performance (Meyer & Rowan 1977). Legitimacy is defined as the "congruence between the social values associated with or implied by [organizational] activities and the norms of acceptable behavior in the larger social system" (Dowling & Pfeffer 1975, p. 122).

These strategic responses are dependent on how organizations interpret the isomorphic pressures that they should conform to. According to Oliver (1991), organizations may (1) just conform to institutional norms through an *acquiescence* strategy, (2) balance themselves with their institutional environment through a *compromise* strategy when they confront a conflict between institutional norms and internal organizational objectives, (3) preclude the need for conformity to institutional norms through an *avoidance* strategy, (4) resist the institutional norms by using a *defiance* strategy, or (5) seek to import, influence, or control institutional constituents with a *manipulation* strategy. By relying on these concepts drawn from institutional theory, we build our analytical framework as follows.

4. Constructing an analytical framework

In constructing the analytical framework, we place the concepts of institutional theory into the context of CC adoption. In this conceptual paper, our arguments are more descriptive than normative. We examine the plausibility of the framework by bringing in relevant literature on the use of CC in specific and enterprise systems since our focus is on the adoption of CC at the organizational level.

Field-level changes. We start by identifying relevant organizations that form the organizational field. Field-level changes, such as the enactment of new government regulations, the ways of collaborating between business partners, and the advent of new CC services, trigger various isomorphic pressures. In the context of CC adoption, it is important to understand "how technologies are embedded in complex interdependent social, economic, and political networks, and how they are consequently shaped by such broader institutional influences" (Orlikowski & Barley 2001, p. 154). Based on our review of the extant literature, we identify the relevant organizations at the field level, which are summarized in Table 1.

Table 1: Organizations at the field level

Organization	Description	References
CC providers	Various forms of CC (SaaS, PaaS, and IaaS) offered by CC providers, along with their promised benefits and associated potential risks, affect CC adoption.	Armbrust et al. (2010)
Peer organizations	Organizations develop this trust through asking their peers about their perceptions of CC providers' capabilities and reputations.	Altaf & Schuff (2010) Heart (2010) Yao et al. (2010)
Business partners	Business partners (e.g., customers and suppliers) may affect the organization's decision to adopt CC services in order to keep on their partnership.	Li et al. (2012)
Professional and industry associations	Professional and industry associations may develop guidelines to facilitate CC adoption, as well as evaluation criteria to select appropriate CC providers.	Badger et al. (2011) Kshetri (2012)
Regulators	Regulators may enact obligations on CC providers to inform the adopting organizations about the protection of data security, privacy, and integrity. This is more important among government agencies.	Marston et al. (2011) Kshetri (2012)

Institutional isomorphism. As stated previously, various isomorphic pressures may be the result of changes at the field level. *Coercive* pressures may be exerted by other organizations through compulsory power such as parent organizations or trading partners with higher bargaining powers (Chong & Ooi 2008).

Other organizations may adopt CC because of their learning process, such as adhering to professional standards or observing earlier adopters. This process, which enables them to see potential benefits that may be harvested (Herhalt & Cochrane 2012), creates a *normative* isomorphic pressure. They assess and explore the value proposition of CC before making a decision.

Mimetic pressures may emerge from industry trends, the media, and consultants' influence (Benders et al. 2006). For example, SMEs may lack internal IT expertise, and, consequently, the easiest way for them make a decision about adopting CC is to follow the industry hype or what is suggested by, for example, the media, white papers, and consultants. Table 2 summarizes three types of isomorphic pressure, which result from field-level changes and influence organizations' decisions to adopt or not to adopt CC.

Table 2: Institutional isomorphism

Isomorphism	Description	References
Coercive	Organizations adopt CC for regulatory compliance reasons or because they forced by other organizations through compulsory power.	Chong & Ooi (2008) Zielinski (2009) Low et al. (2011) Herhalt & Cochrane (2012) Li et al. (2012)
Normative	Organizations adopt CC because they are influenced by learning processes or a convincing power of other organizations.	Yao et al. (2010) Low et al. (2011) Herhalt & Cochrane (2012)
Mimetic	Organizations adopt CC to become similar to other adopting organizations, without a thorough reflection process.	Benders et al. (2006) Parakala & Udhas (2011) Sultan (2011)

Strategic responses. Types of isomorphic pressures, to a great extent, influence a set of possible strategic responses that an organization may choose from (see Table 3). An organization that faces a coercive isomorphic pressure from either its parent or regulatory body most likely has no other choice than to adopt CC (Chong & Ooi 2008). Thus, it will adopt an *acquiescence* response. This response may also be a result of a proper study conducted by the potential adopters preceding their decision to adopt full implementation of CC (Herhalt & Cochrane 2012). In another extreme, some organizations choose a *defiance* strategic response by deciding not to adopt CC due to some reason, such as being unsure about the validity of the promises of CC, a lack of customization opportunities, or dissatisfaction with the offerings/pricing by the vendors (Yao et al. 2010; Herhalt & Cochrane 2012). The other possible strategic responses that exist between these two extremes include compromise, avoidance, and manipulation.

Table 3: Strategic responses

Strategy	Example of response	References
Acquiescence	Organizations adopt CC with or without any reflection. Some of them conduct a proper study and decide to choose full implementation, while others do so simply by following the norms, business hype, and/or regulatory force.	Chong & Ooi (2008) Herhalt & Cochrane (2012)
Compromise	Organizations develop an adoption strategy, such as by adopting CC to run parts of their strategic information systems or by combining public and private/community clouds.	Parakala & Udhas (2011) Herhalt & Cochrane (2012)
Avoidance	Organizations adopt partial implementation and conduct testing of a proof of concept, such as using CC to run parts of their nonstrategic information systems.	Herhalt & Cochrane (2012) Lin & Chen (2012)
Defiance	Organizations decide not to adopt CC at all.	Ernst & Young (2012) Herhalt & Cochrane (2012)
Manipulation	Organizations establish their own private or community CC.	Marston et al. (2011) Brian et al. (2012) Herhalt & Cochrane 2012)

For the *compromise* strategic response, organizations may develop an adoption strategy (Herhalt & Cochrane 2012); for example, they may decide to adopt hybrid clouds by keeping mission-critical applications on the private/community cloud and transferring noncritical applications to the public cloud (Parakala & Udhas 2011). Some organizations may use *avoidance* strategic response by adopting partial implementation of CC for purposes of trialability (Herhalt & Cochrane 2012). When an organization decides to adopt a *manipulation* strategic response, they may establish their own private or community cloud (Herhalt & Cochrane 2012). This strategy is most likely to be adopted by LEs or a group of SMEs that want to have full control over their privacy

and service quality. A previous study pointed out that LEs are concerned about the service quality of CC and control over their data; hence, they may implement private CC although it requires capital expenditures (Marston et al. 2011).

To sum up, based on the core concepts of institutional theory and the extant literature, we have contextualized the analytical framework of CC adoption (see Figure 2, an extension of Figure 1). Our framework provides insights to better understand how and why organizations adopt or do not adopt CC to support their business. We have identified a number of relevant organizations that comprise the organizational field: CC providers, peer organizations, business partners, professional and industry associations, and regulators. We have also revealed possible isomorphic pressures that are relevant to studying the adoption of CC. Further, we have attempted to translate five institutional strategic responses proposed by Oliver (1991) into the context of CC adoption.

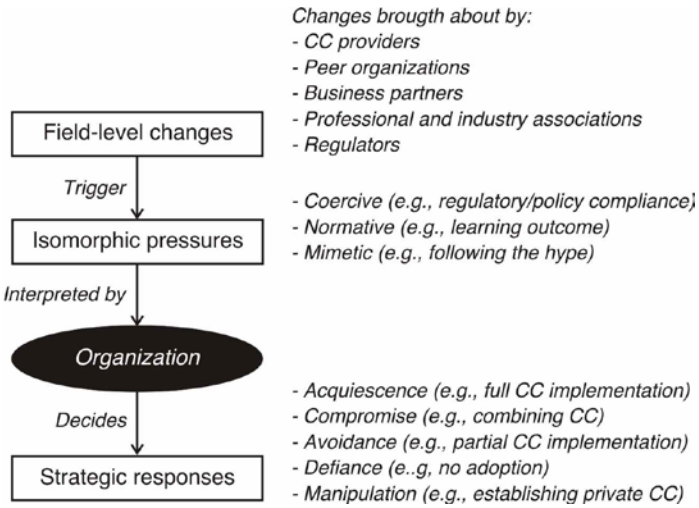

Figure 2: The analytical framework

5. Concluding remarks

We have presented an analytical framework based on core concepts drawn from institutional theory to understand the adoption of CC among organizations. Although it is supported by plausible arguments based on the extant literature, it should not be viewed as a simple checklist and used mechanically. To avoid this trap, future studies may delve further into each concept by tracing the CC adoption process (Suddaby 2010. It is important to note that while some IT innovations have become successfully embedded and routinized in organizations, some are only used at the ceremonial level to gain legitimacy and are decoupled from everyday practices (Meyer & Rowan 1977; DiMaggio & Powell 1983; Boxenbaum & Jonsson 2008; Currie 2009).

This analytical framework does not explicitly pay attention to the *how* and *why* of CC adoption. It is important to understand the process of how an organization interprets the field-level changes, and it is equally important to gain insights into why an organization decides to adopt a certain strategic response over others. Both external and internal factors may be considered in this process. These voids could be addressed through empirical investigation and by bringing in other concepts from either institutional theory, such as institutional work (Lawrence & Suddaby 2006) or institutional logic (Thornton & Ocasio, 2008), or other relevant theories, such as the stakeholder theory (Mitchell et al. 1997). Additionally, this phenomenon can be studied by engaging in interpretive research (Suddaby 2010) and by conducting multiple case study (Mills et al. 2006) with carefully selected organizations from various contexts (such as from developed and developing countries and from different industry sectors). Our hope is that the proposed analytical framework can be validated, fine-tuned, and extended by future research.

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