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# **A Review of Innovation Diffusion Theories and Mechanisms**

*Research-in-Progress*

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## **Abstract**

*Many innovation studies focus on adoption behaviors at the individual and organizational level, while studies examine innovation adoption at the community and population level is relatively limited. These studies, focusing on the diffusion of an innovation across organizations, are important as they illustrate the dynamics of adoption behaviors in a broader context of socio-political factors. In this review study, we examine three prominent diffusion theories: classic diffusion theory, institutional diffusion theory, and cognitive-institutional diffusion theory. We identify the underlying diffusion mechanism in each theory. Future research is needed to show how these diffusion mechanisms interact in creating various diffusion patterns.*

**Keywords:** innovation adoption, diffusion theory, diffusion mechanism

# **A Review of Innovation Diffusion Theories and Mechanisms**

*Research-in-Progress*

## **Introduction**

Innovation studies play a dominant role in Information Systems research, exploring the various factors that influence the adoption, implementation, and use of an innovation (Fichman 2004; Lucas et al. 2007; Van de Ven et al. 2008; Zmud 1984). A majority of these studies focuses on factors that drive adoption behaviors of individuals and organizations (Fichman 2004; Premkumar 2003). In comparison, studies that look beyond the boundaries of individual and organizational level adoption are much less common. Recent studies have called for more research at community level, examining adoption behaviors in a collective environment where diverse organizations share a common interest in an innovation (Wang 2009). In other words, we need more diffusion studies, one that emphasize adoption behaviors across organizations.

Exploring these diffusion studies is important to expand our understanding of some of the most debated questions in innovation research. For example, scholars have been arguing on key drivers of adoption behaviors. Economic-rational perspective suggests that adopters implement an innovation for the perceived financial and economic benefits of the innovation (Rogers 2003; Stoneman 1983). On the other hands, institutional theories argue that social gains and social influence impact adoption decisions (Compagni et al. 2015; Kennedy and Fiss 2009). Under a diffusion perspective, if one looks at adoption behavior across organizations it is possible that these different adoption factors coexist: early adopters are driven by economic gains while late adopters are motivated by social gains (Tolbert and Zucker 1983; Wang 2010); or both economic and social gains are considered for adoption, but economic evaluations determine the abandonment of the innovation (Strang and Still 2004).

In this review paper, we examine several diffusion theories to understand the various mechanisms through which an innovation spreads across an organizational community or population. From the innovation literature we identify three distinct diffusion theories: classic diffusion theory (Rogers 2003), institutional diffusion theory (Abrahamson 1991; Tingling and Parent 2002), and cognitive-institutional diffusion theory (Elliott and Kraemer 2008; Strang and Macy 2001; Swanson and Ramiller 1997). We review each theory and tease out different diffusion mechanisms. These mechanisms can help to clarify some debates in innovation research.

The paper will proceed as follows. We first provide definitions for some basic innovation. Then we review the three diffusion theories and conclude with some suggestions for future research.

## **Basic Definitions: Innovation, Adoption, and Diffusion**

While innovation is studied in multiple fields, there is a lack of consistency across research regarding constructs such as “innovation” or “innovativeness” (Garcia and Calantone 2002). Generally, scholars recognize innovation as a new way of conducting or carrying out organizational activities, whether in the form of new ideas (Rogers 2003; Swanson 1994; Van de Ven et al. 2008), new production combinations (Schumpeter 1968), or new technological process (Garcia and Calantone 2002). The issue, however, arises when confronting the question of *to whom* the innovation is new. In other words, the question concerns the level of novelty or innovativeness of an innovation.

Innovation studies recognize two perspectives. The macro perspective is concerned with innovation that is new to the world, the market, or an industry while the micro perspective is concerned with innovation that is new to the firm or the customer (Garcia and Calantone 2002). The micro perspective asserts that at the minimum, the innovation is new to the adopting unit. This view is dominant in innovation studies at individual and organizational level (2005; Rogers 2003; Van de Ven et al. 2008). However, under this micro perspective, virtually all technological implementations can be considered an innovation. This view is rather limited and certainly does not set a high bar.

On the other hand, the macro perspective emphasizes the impact of innovation at a broader level, thus considering innovation as new to the world or new to the market (Garcia and Calantone 2002). Swanson (1994) defines innovation as the adoption of a new idea to the adopting organization, but limited that only the first or early adopters within an organizational population to be recognized as innovators. In other words, the innovation is essentially new to the world or an organizational population. Certainly, this is a narrower view of innovation, but a higher standard. It excludes technologies that are mature to a broad community but new to adopting organizations.

For the purpose of this study, we define innovation as the implementation of a new idea in organizational practices that is new to the world, or at the minimum, new to an organizational community (Swanson 1994). Consistent with this definition, innovation adoption studies are viewed as the micro perspective, emphasizing the implementation and assimilation of an innovation within an organization, that is, across its sub-units, departments, and groups. It can be considered as intraorganizational adoption of innovation (Lewis and Seibold 1993). Examples include studies of technology acceptance (Davis 1989; Davis et al. 1989), task-technology fit (Goodhue 1995), or technology appropriation (Poole and DeSanctis 1990).

On the other hand, diffusion denotes the dissemination of a trait, product, or service within a social system (Strang and Soule 1998). Thus, diffusion studies belong to the macro perspective, focusing on the widespread adoption and dissemination of an innovation within an organizational population or community, that is, across organizations and groups of organizations. Therefore, it is concerned with interorganizational adoption of innovation. Some instances are the study of multidivisional form adoption among large firms (Fligstein 1985), the adoption of civil service reform among U.S. cities (Tolbert and Zucker 1983), or the spreading of Enterprise Architecture in the U.S. federal agencies (Hjort-Madsen 2007).

In this study we distinguish between diffusion theory and diffusion mechanism. Mechanism is “a way of acting” (Bhaskar 2008)(p. 51); it is the underlying power that produce the phenomenon of the world. While diffusion theory provides the conceptual model of how an innovation is disseminated within an organizational community, a diffusion mechanism is the underlying power that drives the dissemination, the force that transfers an innovation across organizations (Shipan and Volden 2008). A diffusion theory may have one or many diffusion mechanisms to explain how and why an innovation is disseminated.

<b>Table 1: Basic Definitions</b>		
Concept	Definition	References
Innovation	A new idea in organizational practices that is new to the world, or <i>at the minimum</i> , new to an organizational community.	Swanson (1994); (Schumpeter 1968)
Innovation Adoption	The implementation and assimilation of an innovation within an organization.	Lewis and Seibold (1993)
Innovation Diffusion	The dissemination of an innovation within an organizational population or community.	Strang and Soule (1998)
Diffusion Mechanism	The underlying power that drives the dissemination of an innovation across organizations. In other word, it is the force that transfers an innovation across organizations.	Bhaskar (2008); Shipan and Volden (2008)

## Methodology

The purpose of this study is to identify various diffusion mechanisms that underline diffusion theories. This helps us better understand how diffusion theories are applied in particular situations. We follow a literature review procedure (Webster and Watson 2002) to examine various diffusion theories and identify their mechanisms. We first search for diffusion studies in leading IS and management journals (AIS Basket of Eight, Academy of Management journals, Organization Studies, Organization Science). Because we are interested in diffusion theories, we only focus on studies that examined adoption at the population or community level. Next, we go backward and forward with our key articles to identify relevant articles in their citations as well as subsequent research that cites those key articles. In the next step, we synthesize our findings and compared with some prior diffusion research reviews (Berry and Berry 2007; Dearing and Meyer 2006; Fichman 2000; Fligstein 1985; Hargrave and Van De Ven 2006; Lyytinen and Damsgaard 2001; O'Neill et al. 1998; Shipan and Volden 2008; Wang 2009) for content validity.

## Diffusion Theories and Mechanisms

In this section, we review three prominent diffusion theories, drawing from several streams of literature (e.g., social studies, organization studies, social movements, Information System (IS) studies). They are: 1) classic diffusion theory, 2) institutional diffusion theory, and 3) cognitive-institutional diffusion theory (Strang and Meyer 1993; Strang and Soule 1998). While there are many diffusion theories, these three streams represent the majority of diffusion mechanisms observed.

### ***Classic Diffusion Theory***

Studies in the classic diffusion stream take a contact model of diffusion in which point-to-point interactions spread an innovation across a population (Strang and Meyer 1993; Strang and Soule 1998). The focus is usually on communication processes and channels, asking how and why an innovation is introduced and transferred between adopters. Classic diffusion studies are also an information-based model in which prior adopters or innovation promoters provide information to prospective adopters through word-of-mouth, person-to-person contact, or mass media (Rogers 2003; Ryan and Gross 1943).

The underlying causal mechanism for classic diffusion studies is a *contagion* process in which an adopter with actual or latent needs comes in contact with an innovation or representation of an innovation (e.g., a description, an advertisement) that meets the needs. Upon contact, the innovation is recognized as a solution to particular needs, and is subsequently adopted. For example, Ryan and Gross (1943) analyzed the diffusion of hybrid corn among Iowa farmers in the 1930s. They found that farmer-to-farmer exchanges of hybrid corn experience played a critical role in the diffusion process. Once farmers learned from their neighbors about the advantages of hybrid seeds, they were more likely to adopt the new practice.

Classic diffusion theory inspired innovation studies in various fields, setting up the research methodology and approach for studying the diffusion of innovation (Rogers 2003). One premise of classic diffusion theories is the focus on the direct benefits of innovations as primary drivers for adoption. Upon learning of the advantages of the innovation or understanding how the innovation can be a solution to a particular issue, prospective adopters are more likely to adopt. In other words, it is believed there is inherently something good about innovations that makes them appealing and beneficial to adopters. This is often known as the *pro-innovation bias* in classic diffusion studies (Rogers 2003). Additionally, classic diffusion studies also stress the reflective and internal calculations of adopters (Strang and Meyer 1993). Prospective adopters are assumed to be rational decision makers who can make adoption decisions based on the merits of the innovation alone. This assumption underpins many innovation studies, and is still considered one of the primary assumptions about adopters (Stoneman 1983; Tornatzky and Fleischer 1990; Wang 2009).

On the other hand, classic diffusion theory are not without criticism. Opponents claim that institutional influences are largely ignored in the decision making process, making classic diffusion studies over-rationalized (Strang and Macy 2001). An adoption decision is often made based on internal calculations of bounded rational managers with little regard to context, environment, or network influences. While this view may be sufficient to explain adoption of simple innovations among individuals, it seems inadequate for complex innovations at the organizational level (Fichman 2000) or situations in which high uncertainty forces adopters to rely on others' adoption decisions (Tingling and Parent 2002).

### ***Institutional Diffusion Theory***

Institutional diffusion theory pays particular attention to the influences from context and environment on organizational adoptions, emphasizing a larger historical and spatial context than the classic diffusion studies. These studies are influenced by institutional theories, asking why and how institutional arrangements reproduce, diffuse, or decline in a population or organizational field (DiMaggio and Powell 1983; Scott 2008; Tolbert and Zucker 1983; Van De Ven and Hargrave 2004). Organizations, operating in institutional contexts, are often the unit of analysis in institutional diffusion studies. Examples include Abrahamson and Fairchild's (1999) analysis of management fashion in innovation adoption and Tingling and Parent's (2002) emphasis on the diminishing role of mimetic isomorphism.

The underlying causal mechanism for institutional diffusion studies is a *conformity* mechanism in which organizations comply with external influences or pressures. Those influences can come in the forms of emulating peers or competitors (i.e., imitation), following directions from regulators or powerful

organizations (i.e., coercion), or satisfying a standard or obligation (i.e., norm) (DiMaggio and Powell 1983; Scott 2008). Unlike classic diffusion studies, the triggers for adoption in institutional diffusion studies are concerns for the losses from non-adoption. Organizations are more motivated to avoid losses in business opportunities due to non-adoption than they are to maximize benefits from adoption (Kennedy and Fiss 2009; Lyytinen and Damsgaard 2001). For example, Damsgaard and Lyytinen (1997) found that many organizations joined a strategic EDI network in Hong Kong because of the fear of losing important business opportunities once their partners joined.

Subsequently, institutional diffusion theory is often recognized for stressing the indirect benefits of innovation adoption: the *symbolic* benefits (DiMaggio and Powell 1983). These symbolic benefits are defined as “the extent to which they generate positive social evaluation” (Heugens and Lander 2009)(p. 63). Organizations enjoy not just the direct outcomes of adopting an innovation, but also the perceptions of external observers toward their adoptions. Organizations will be willing to adopt an innovation despite the uncertainty of outcomes if there is evidence of those symbolic benefits (e.g., reputational advantages, status of organization, or legitimacy). As a result, institutional diffusion studies emphasize institutional influences in adoption decisions (DiMaggio and Powell 1983; Scott 2008; Van De Ven and Hargrave 2004).

However, while it is important to highlight the impact of institutional influences on decision making, institutional diffusion studies are criticized for overemphasizing the effects of institutional contexts (Heugens and Lander 2009; Tolbert and Zucker 1996). Much less efforts have been made to show how and why early adoptions occur or how innovative practices get institutionalized.

Furthermore, another theoretical problem of institutional diffusion theory is the stress on social and environmental determinism at the expense of human agency (Child 1997). Thus, institutional diffusion studies are criticized as being *under-rationalized* because adopters rely heavily on others’ decisions to make their own (Strang and Macy 2001). This view also assumes two conditions: 1) the presence of powerful regulators or organizations to exert their influences and 2) the high uncertainty of the innovation which makes others’ adoption a useful reference (Bui 2011; Tingling and Parent 2002). In situations in which there is no clear authority among organizations, or uncertainty is not high, organizations may rely more on their calculations to make autonomous decisions.

### ***Cognitive-Institutional Diffusion Theory***

Another view on diffusion research is found in the social movements literature, focusing on collective actions that facilitate or constrain innovation adoptions or social movements, and how those collective actions emerge and change (Strang and Soule 1998; Van De Ven and Hargrave 2004). Cognitive-institutional diffusion theory shares with institutional diffusion theory interest in the effects of context and environment, but stresses the emergence and changes of collective actions at the population and community level (Van De Ven and Hargrave 2004). Therefore, cognitive-institutional theory is a subtype of institutional diffusion because they provide insights on areas that institutional diffusion theory lacks: the micro processes of institutional work. And like classic diffusion theory, cognitive-institutional diffusion theory emphasizes the importance of information that facilitates and enables sense-making of the innovation. In other words, information at the collective level allows cognitive learning about the innovation at the organizational level (Wang 2009; Wang and Ramiller 2009). Hence the term “cognitive-institutional.” Some examples of cognitive-institutional diffusion studies are institutional work at the macro level (Greenwood et al. 2002; Hinings et al. 2004; Tolbert and Zucker 1996), the adaptive emulation model (Strang and Macy 2001), organizing vision theory (Swanson and Ramiller 1997), and technological action frames (Elliott and Kraemer 2008; Iacono and Kling 2001; Markus et al. 2008).

Because of the focus on collective actions to guide organizational adoptions within a population or community, the underlying causal mechanism for cognitive-institutional diffusion theory is a *social learning* mechanism. It is the process in which prospective adopters obtain necessary adoption knowledge and information from collective adoption rationales that reside within the organizational population. The trigger for diffusion is the *information threshold* that prospective adopters have to overcome in order to bypass certain levels of skepticism or concerns toward the innovation. These information or knowledge gaps trigger actions at the collective level to generate and accumulate the necessary information for the audiences. This explains why a number of cognitive-institutional diffusion studies emphasize the creation of collective frames and interpretive schemes which provide an interpretive lens for prospective adopters (Elliott and Kraemer 2008; Markus et al. 2008).

A merit of the cognitive-institutional diffusion theory is the view that the adoption rationale is created in part at the community or population level (Wang 2009; Wang and Ramiller 2009). Know-how, know-why, and know-what are generated by thought-leaders, associations, practitioners, or academics. This presents several theoretical advantages. First, scholars can examine the effects of institutional forces in organizational communities or populations that have no clear authority or powerful organizations. The emergence of social movements or institutional forces is socially constructed through the actions of various actors within the community. Second, adoption decision-making can focus on both institutional influences and cognitive processes. Prospective adopters have the agency to determine which information is useful to their decisions, while institutional influences can exert power over adopters through the information they provide (collective frames), and the way the information is presented to adopters (framing, rhetoric).

Cognitive-institutional diffusion theory also has a few criticisms. First, there is a lack of attention to adoption needs and how those needs impact adoption decisions. For example, the organizing vision theory (Swanson and Ramiller 1997) asserts that the vision draws its meaning and language from the *IS practitioner subculture* in response to a *business problematic*. The IS practitioner subculture helps test the plausibility of the vision, while the business problematic determines the vision’s perceived practical importance. However, how the business problems and the plausibility of the vision (i.e., needs for adoption) emerged and were presented in the practitioner discourse was not addressed.

Second, cognitive-institutional diffusion theory largely ignores the characteristics of the innovation to the diffusion process in terms of features and affordances enabled by those features. Because one of the goals for collective action is to provide the necessary knowledge to prospective adopters, it becomes extremely important to include the innovation characteristics within the process: what kind of features the innovation provides, what kind of affordances are made possible by those features, what kind of innovation configurations are available, and how those features and affordances fit adopters’ needs. Some scholars have offered the concept of *technology ensemble interactions* as a way to account for the missing role of innovation characteristics (Markus et al. 2008). Nevertheless, cognitive-institutional diffusion theory still needs a way to include more consideration for innovation characteristics in the diffusion process.

**Table 2: Diffusion Theories**

	Classic Diffusion	Institutional Diffusion	Cognitive-Institutional Diffusion
Definition	A contact model of diffusion in which point-to-point interactions spread an innovation across a population.	A macro model of diffusion in which the influences of context and environment on organizations are emphasized.	A macro model of diffusion which focuses on processes that facilitate or constrain innovation adoption, how those processes emerge and impact changes.
Diffusion Mechanism	<i>Contagion</i> mechanism which occurs when an adopter with particular needs comes in contact with an innovation that meets the needs.	<i>Conformity</i> mechanism which occurs when an organization complies with external influences or pressures.	<i>Social learning</i> mechanism which occurs when prospective adopters obtain necessary knowledge and information from collective rationales.
Strengths	<ul style="list-style-type: none"> <li>• Focus on the direct benefits of innovations</li> <li>• Focus on the reflective and internal calculations of adopters</li> </ul>	<ul style="list-style-type: none"> <li>• Focus on the indirect benefits of innovations (i.e., symbolic benefits)</li> <li>• Focus on institutional influences in decision making</li> </ul>	<ul style="list-style-type: none"> <li>• Focus on the collective rationale that exists at the community level</li> <li>• Focus on the cognitive processes of decision making</li> </ul>
Limitations	<ul style="list-style-type: none"> <li>• Limited consideration of institutional influences</li> <li>• Assume low uncertainty that the innovation is the solution</li> </ul>	<ul style="list-style-type: none"> <li>• Overemphasize the effects of institutional effects</li> <li>• Require presence of powerful regulators or organizations to exert their influences</li> </ul>	<ul style="list-style-type: none"> <li>• Limited attention to adoption needs</li> <li>• Limited attention to the fit between innovation characteristics and adopters</li> </ul>

	• Difficult to apply to complex innovation	• Assume high uncertainty	
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## Discussion

In reality, the identified diffusion mechanisms often work simultaneously and complementarily throughout the diffusion process. Innovation studies have attempted to identify the conditions in which these mechanisms are invoked. For example, scholars has suggested that time plays a crucial role: contagion mechanism is more influential in early stages of diffusion while conformity and social learning are more influential in later stages (Fligstein 1985; Tolbert and Zucker 1983; Wang 2010). Yet, recent studies point out that all mechanisms may present throughout the diffusion process regardless of time (Compagni et al. 2015; Kennedy and Fiss 2009).

We argue that such empirical discrepancies are results of changing contexts in diffusion process. They are the rise of globalization and the prominent role of the Internet and social media platforms. These changing contexts introduce new concepts that need to be considered in diffusion studies (see Table 3).

The basic assumption of diffusion theories is an innovation will transfer across organizations within a population and community. However, in today economics, companies are competing against not only local peers in the same geographical location and industry but also international corporations. It means organizations rely on a much larger network of organizations to identify new practices that give them competitive advantages (Archibugi and Simona 2002). It is not only about “keeping up with the Jones” but also about “keeping up with the Lees”—companies that operate overseas and taking up your market share. Local companies also constantly search for innovative practices overseas to exploit new opportunities.

The way information is passed from one organization to the others also change. Previously, organizations rely on leading firms, professional associations, consultants, and IT vendors for cues of innovative practices, to stay informed and learn about emerging innovations. Today, with the rise of the Internet and social media platforms, there are different drivers and gatekeepers for information (Whelan et al. 2010). Search engines and social media platforms inform firms about new trends, provide them new ways to reach out and interact with their customers and vendors. User-generated contents provide feedback about new practice that require firms’ response.

<b>Table 3: Emerging Concepts for Diffusion Studies</b>		
	Old Concepts	Emerging Concepts
Diffusion Factors	Positive traits, time, regulation, success stories	Discursive trends, fashion, responsive mechanisms
Diffusion Gatekeepers	Early adopters, knowledge brokers, professional associations	Search engines, social media platforms
Diffusion Drivers	Vendors, consulting firms, innovation promoters	User-generated contents (reviews, blogs, comments)

## Conclusion

In this review paper we assess three prominent diffusion theories in the literature. Our purpose is to distinguish the different diffusion mechanisms that underlie how an innovation is transferred across organizations. Understanding these diffusion mechanisms is important because it allows us to clarify some debates in the innovation research: what mechanisms influence adopters at a given time, how do mechanisms interact given different population structures, or how mechanisms work for different types of innovation. We argue that the rise of globalization, the prominent role of the Internet and social media platforms have introduced new concepts that require more attention from diffusion studies. It is our hope that this review study will motivate more research looking at innovation diffusion and the dynamics of diffusion mechanisms. Such research agenda will go beyond the conventional boundaries of innovation studies, something that has been desperately sought after in innovation research (Fichman 2004; Lucas et al. 2007).

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