



The role and contributions of sociological institutional theory to the socio-technical approach to innovation theory

Andriele De Prá Carvalho^{a,*}, Sieglinde Kindl da Cunha^b, Luciano Ferreira Lima^c,
Danielle Denes Carstens^b

^a Universidade Tecnológica Federal do Paraná – UTFPR, Paraná, PR, Brazil

^b Universidade Positivo, Paraná, PR, Brazil

^c Universidade Estadual do Centro-Oeste – Unicentro, Paraná, PR, Brazil

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Abstract

This study seeks to broaden the analytical scope of the socio-technical approach to innovation theory through the incorporation of a few theoretical constructs from sociological institutional theory. This work is relevant due to its linking of these two theories which have points in common in the explanation of the variables and phenomena that they study, such as the possibility that innovation is diffused through the institutional bases and legitimacy of Institutional Theory, as well as the fact that the relationships between system actors can influence these results. This study uses a narrative literature review to compare these two theories and presents a significant result in applying contributions from institutional theory to the theory of innovation.

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Keywords: Institutional theory; Innovation theory; Socio-technical approach

Introduction

Environmental pressures make it necessary for organizations to define action strategies to guarantee their survival and legitimacy. Institutional Theory is based on the notion that, in order to survive, organizations need to convince their public that they are legitimate entities that deserve support (Meyer & Rowan, 1991). To gain this legitimacy, organizations create perpetual symbols, ceremonial activities and stories.

Organizational Theory and its theoretical contributions help us to understand and analyze organizations, providing different perspectives to comprehend them. Theory then serves as a guide in defining different approaches to the relationship between an organization and its environment (Hatch & Cunliffe, 2006). In

this way, the institutionalization of Innovative Systems can be explained by Institutional Theory and its theoretical contributions.

This study deals mainly with Institutional Theory, its role and the theoretical bases that influence organizational studies. This in turn has an effect on Innovation Theory, and also explains the importance of Institutional Theory and its theoretical contributions in the analysis of institutions and legitimacy as a way of understanding the innovation process within organizations. Thus, the objective of this study is to broaden the analytical scope of the Socio-Technical Approach to the Theory of Innovation through the incorporation of several constructs from Sociological Institutional Theory in analyzing Innovation from the point of view of Institutional Theory, or in other words, the role of institutions in the Theory of Innovation. The most relevant sources of data were studies of Innovation and Institution Theory.

* Corresponding author.

E-mail: andridpc@gmail.com (A.P. Carvalho).

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Methodology

The method used in this study is a narrative literature review. Therefore it doesn't seek to exhaust sources of knowledge about theory in a systematic fashion, but instead studies the principal authors and their works to form a body of knowledge that will be useful in the development of ideas and logical arguments that will enable us to infer which gaps in knowledge may be explored using the Socio-Technical Approach to Innovation based on the contributions provided by analyzing several constructs of Sociological Institutional Theory.

The articles were selected using the criterion of the number of direct references to them in the following search databases and websites: Academic Google, Spell and Web of Science. They were used in a search that wasn't exhaustive, being mainly based on Institutional Theory.

In this way, we seek to identify the literature about how institutionalization processes occur, as well as the main constructs in both theories. Then we relate the main contributions of Sociological Institutional Theory to the Socio-Technical Approach to Innovation Theory.

Institutionalization and institutional theory

Institutional Theory is a continuation and extension of the intellectual revolution that began in the 1960s, which introduced the concept of open systems in the study of organizations. It came to recognize the significant organizational effects that are associated with the increase of cultural and social forces: the institutional environment. Organizations came to be seen as being more than productive systems; they are cultural and social systems (Scott, 2001). Articles by Meyer and Rowan (1991) and DiMaggio and Powell (1983) were key to the growth of Institutional Theory, which has come to encompass a large variety of phenomena within the field of organizational studies (Tolbert & Zucker, 2006).

Sociological Institutional Theory is a coherent whole which encompasses a view of the world (ontology) as well as the knowledge that comes from the relationship between subjects and objects (epistemology). In this sense, one of the main assumptions of Sociological Institutional Theory has to do with the social construction of reality (Berger & Luckmann, 1985), in which the conscience of individuals occurs in a subjective way through a complex interaction of institutional processes. Therefore, it is different from the individual in neoclassical economics who displays a practical/utilitarian rationality, as well as the individual who is alienated from his or her labor by those who own capital and are dominant in terms of material conditions, as in dialectical and historical materialism.

According Scott (quoted from Scott & Davis, 2008, p. 258), "institutions are made up of cultural-cognitive, normative and regulative elements, which together with associated activities and resources offer stability and meaning to social life." In general, according to Scott and Davis (2008), these three forces are present in totally developed institutional systems, with economists and political scientists placing emphasis on regulative, sociological and normative factors, and anthropologists and

organizational theorists placing emphasis on cognitive-cultural factors.

The units of analysis of Institutional Theory are organizational fields and populations. Its basic assumptions can be defined as follows: 1. Reality is socially constructed; 2. Organizations are the concretization/materialization of institutions; and 3. Organizations have similar structures and practices because they seek legitimacy.

In Sociological Institutional Theory, organizations and their transactions in an uncertain environment don't just seek the rationalization of processes and spending, but also legitimacy through organizational structures and practices that are similar to the organizational field. The institutional perspective, according to Carvalho, Vieira, and Lopes (1999, p. 6), "abandons the conception of an environment formed exclusively by human, material and economic resources to emphasize the presence of cultural elements: values, symbols, myths, system beliefs and professional programs."

There are various forms of institutionalism in various fields of knowledge (Guarido Filho & Costa, 2012). However, sociological organizational institutionalism offers important contributions to the study of organizations in expressing social values. As understood by Carvalho et al. (1999, p. 7) "technical and institutional environments sustain different rationales: in a technical environment the 'rational' is what enables organizations to be efficient and produce goods and services that are accepted by the market and thus achieve their goals; in an institutional environment, on the other hand, rational action is represented as a procedure that can give the organization legitimacy in the present and the future."

Through theoretical development, depending on ontological and epistemological positioning, one can explain, represent, synthesize, and make predictions or inferences about reality. Institutional Theory has gone through various transformations in terms of its episteme, thus providing a variety of different looks at social phenomena. It should be pointed out that some constructs have become central to organizational literature, such as, for example: institutional environment, legitimacy, isomorphism and organizational field, which have elevated investigations to the level of complex socio-cultural relationships.

In terms of isomorphism, an organizational phenomenon identified and named by DiMaggio and Powell (2007), there is in fact a surprising homogeneity of organizational forms and practices (DiMaggio & Powell, 2007). The rationalist conception of organizational reality is based on the assumption that organizations are oriented by objectives and the search for efficiency. However, organizations constitute the concretization of socio-cultural and cognitive interactions, which seek legitimacy within a given social context. This explains from an organizational institutional theory perspective why similar organizational practices have been adopted.

The concept of the organizational field should also be emphasized within Sociological Institutional Theory. According to Scott (2008), it can be viewed as a unit or level of analysis, involving relational and symbolic dimensions that encompass all relevant actors (DiMaggio & Powell, 1983), institutional logic and governance structures. It can also be viewed as having

become the central concept of Neo-Institutional Theory (Wooten & Hoffman, 2008). Strictly speaking, the field is “a community of organizations that share systems of significance and whose participants interact more frequently and decisively between one another than with actors outside of the field” (Scott, as quoted in Wooten & Hoffman, 2008, pp. 130–131).

The seminal definition of organizational fields made by DiMaggio and Powell (1983, p. 148) refers to “those organizations that, in aggregate, constitute a recognized area of institutional life: key suppliers, consumers of resources and products, regulatory agencies and other organizations that produce similar products and services.” DiMaggio and Powell (1983, p. 148) add that “the virtue of this unit of analysis is that it directs our attention” to the “totality of relevant actors,” not just those in organizational interaction networks (Scott, 2008, 184).

According to Scott (2008, p. 184), organizational fields can develop “around central disputes and issues.” In this respect Hoffman (as quoted by Scott, 2008, pp. 184–185) suggests that “a field is formed around issues that become important to the interests and goals of a specific group of organizations,” and he also affirms that “issues define what the field is, making connections that couldn’t previously be established. [...] The participation of an organization is defined by patterns of social interaction.” Membership in the field can also be for a finite period of time, coinciding with an emergency, and the growth and decline of an issue.

Organizational behavior is guided by the definition of issues as well as institutional influences. The constituents of a field have different purposes, but they have this theme in common which leads to debates and conflicts based on power relationships (Wooten & Hoffman, 2008). One can, based on this analytical perspective, observe the organizational field’s dynamic. However, in more stable fields, when the dispute of issues is not intense due to the existence of better defined institutional logic with greater legitimacy, this application is more difficult. (Machado-da-Silva, Guarido, F, & Rossoni, 2010).

The actors’ intentions, individually or collectively, are not directly related to the creation, maintenance or extinction of institutions for several reasons: (1) the *modus operandi* of the actors is conditioned by the institutions. Reflecting on this in a systematic fashion constitutes abstract intellectual work. Humans in their daily lives live under the aegis of multiple institutions that have complex relationships that are in movement; (2) the capacity for agency is intimately related to the interests and issues at stake, the power relationships, the actors’ positions, and available resources, etc. Institutional change occurs as a function of these factors, generally in an unintentional manner, which makes it impossible to predict; (3) actors, obviously, don’t stop and think: I will resist institutional pressure or I will create an institution (Wooten & Hoffman, 2008). They just resist, create or reconstruct institutions collectively, and not in a deliberate fashion, according to the rules of the game and the possibilities that exist in the social-historical context.

The capacity of actors individually and/or collectively for agency is directly correlated to social skills (Fligstein & McAdam, 2011) associated with their ability to use ideas to

coordinate and communicate, or in other words, power and political relationships within fields. Actors act according to what is at stake (Fligstein & McAdam, 2011), and thus analyze the rules and coordinate their actions to safeguard their own interests. However, the space and limits of this articulation occur within an institutional environment under institutional pressure and conditioning.

The phenomena analyzed by Sociological Institutional Theory are not strictly related to individual actors (the individual or the organization), given that the field, isomorphism, legitimacy, decoupling, ceremonialism, and institutionalization, etc. are phenomena that come from long term social interaction.

The strategic action field approach advocated by Fligstein and McAdam (2011, p. 2) is designed to, among other things, “explain the underlying structure and sources of change and stability of institutional life in modern society. A strategic action field is a middle level of social order where the actors (which may be individuals or collectives) interact with each other with each other’s knowledge under a series of common understandings about the effects of the field, its relationships (including who wields power and who doesn’t) and its rules” (Fligstein & McAdam, 2011, p. 3).

Fligstein and McAdam (2011, pp. 4–5) state that fields are rarely organized around a truly consensual “taken for granted” reality. In other words, conflict, resistance and struggle between actors constitute an active process that is present in all fields. Therefore, action that influences the processes of stability or change in organizational fields possesses a collective character. This means that it is through the actions between incumbent and challenger actors (Fligstein & McAdam, 2011), as well as their positioning within the field, the available resources, and the power relationships and the relationships between state fields and non-state fields, that the creation and maintenance of field institutions or the breaking away from them occurs.

Thus, based on meaning that is attributed and passed along, bureaucratic characteristics turn into a set of institutional precepts in modern society, becoming a socially constructed and legitimized concept of the most efficient way for organizations to function (Fonseca, 2003).

In this sense, using the institutional approach, the form of modern organizations is maintained by a system of beliefs or rational myths that emphasize the relevance of rationality. Legitimacy is conferred by the ability to act in a rational and objective fashion and brings with it rational beliefs about how to identify rational proposals and transform them into rules. Or in other words, the organization functions through the incorporation of guidelines that have been previously defined and rationalized by the society that has contributed to its legitimization or institutionalization (Fonseca, 2003).

Recognizing this isomorphism doesn’t eliminate the attempt to exercise a certain degree of autonomy and control over people in this environment. (Machado-da-Silva & Vizeu, 2007). Institutions are composed of cognitive elements – cultural, normative and regulative – that, together with their associated activities and resources, determine the stability and significance of social life. In a well-developed institutional system, the three systems

Table 1
The Three Institutional Pillars.

	Pillars		
	Regulative	Normative	Cognitive
Bases for conformity	Obedience	Social obligation	Accepted as true
Mechanisms	Coercive	Normative	Mimetic
Logic	Instrumentalism	Conformity	Orthodoxy
Indicators	Rules, laws and sanctions	Certification	Predominance
		Credibility	Diffusion
Bases for legitimacy	Legally sanctioned	Governed morally	Culturally sustained
			Understandable
			Recognizable

From *Institutions and Organizations* by Scott (2001), p. 52.

or elements cited are all present and interact to promote and sustain orderly behavior (Scott, 2001).

Scott (1995) makes analytical distinctions between the three basic components of institutions (normative, regulative and cognitive), as can be seen in Table 1.

These three institutional pillars are defined by Scott (2001) as facets that strengthen and reinforce structures. The regulative pillar involves the capacity to establish rules, monitor compliance to them and, if necessary, manipulate sanctions (rewards or punishments) to influence future behavior (Scott, 2001). The normative pillar emphasizes normative rules that introduce prescriptive, evaluative, and obligatory dimensions to social life. Normative systems include values and norms. Values specify what is desirable or preferable together with the construction of standards which existing structures or behavior can be compared to, while norms specify how things should be done, defining the legitimized meaning of the values adopted (Scott, 2001).

The cultural-cognitive pillar places emphasis on the existence of and the interaction between actors. Symbols (words, signs, gestures) shape the meaning that we attribute to objects and activities. The cognitive structures are constituted by the internalized understanding of each actor, based on the interpretation of his or her own social reality. Different social roles lead to different subjective interpretations on the part of the actor, whose social characteristics vary according to time and space (Scott, 2001). This context is understood in a similar fashion within the Socio-Technical Theory of Innovation.

The articulation between the three mechanisms in the analysis of the transformation process is relevant in any society; however, the specific weight given to each mechanism depends on the context of each society. In traditionally strong democracies with a high level of competition for goods and services, imitative and normative mechanisms of pressure for stability and change tend to dominate (Machado-da-Silva & Vizeu, 2007).

Institutionalization and the theory of innovation

Scientific and technological development demands constant change, being the principal agent of Technological Innovation. However, innovation doesn't occur in isolation, but depends on various factors within the organizational context and this development corresponds to the phenomena of revolutionary changes in the productive life of a society (Schumpeter, 1985).

Dosi (2006) relate the formalization of innovation to the size of a business and Freeman (1974) classifies innovation as radical or incremental depending on its scope and degree of change. In a complementary manner, Lundvall (2010) presents innovation as a continual process that involves not just radical and incremental innovation, but also the diffusion, absorption and utilization of innovation.

Bunnell and Coe (2001) suggest that greater attention needs to be paid to extra-local connections in multidimensional studies of innovation, delineating the complex interactions between the physical space, institutional and regulatory jurisdictions, and the levels at which the actors in innovation systems are operating. On the other hand, Lundvall (2010) deals with the National System of Innovation, linking various important actors to the process.

Broadening innovation studies to include the Socio-Technical Approach, Geels (2004) presents a structural foundation for the innovation system process, emphasizing the multi-level aspect of this approach, consisting of three fundamental levels: niches, regimes and panoramas or environments in which innovation systems are made up of multi-actor processes. And, in the same manner, Dolata (2013) presents a multi-level perspective which concentrates on technological processes and standards and technological change, but also reveals something about the socio-economic impact of a given technology.

Using this logic and influenced by the Theory of Innovation together with competitiveness and sustainability, Coenen and López (2008) propose a model to analyze innovation that reconciles different demands and scenarios and presents the common dimensions of Institutional Theory, which led to their work being selected for this analysis.

According to the Coenen and López (2008) model, the Theory of Innovation has three main approaches, which are: the Sectoral System, the Technological System and the Socio-Technical System. An innovation system is defined as organizational and institutional networks that develop, diffuse and utilize innovations.

The Sectoral System, a concept cited in the work of Schumpeter (1985), is constituted by a sector with activities that join forces and it describes analytically the structural and organizational differences and similarities as well as the boundaries between sectors, seeking to identify what affects innovation, performance and competitiveness between countries in different sectors, focusing on improving public policy (Malerba, 2002).

Table 2
Institutional concepts for these three approaches to innovation.

Approach	Concept	Actors	Institutions
Sectoral System	Based on a product or product group, it involves multiple technologies and is not limited geographically.	Heterogeneous companies with this main focus.	They are like signposts for innovation, focused on regulation and cognition, emphasizing context over structure.
Technological System	Based on the technological domain, involving different sectors which are not limited geographically	Heterogeneous companies with this main focus.	They are like signposts for innovation, focused on regulation and cognition, emphasizing context over structure.
Socio-Technical System	Based on the functioning of society, involving multiple industrial sectors and technologies. Frequently geographically limited (mainly by country)	It mainly analyzes network information.	They are like signposts for innovation, and are regulative, normative and cognitive, and their regime is analyzed both in terms of niches and aggregate levels.

From “Comparing systemic approaches to innovation for sustainability and competitiveness” by Coenen and López (2008).

In other words, it's a transversal perspective that offers a static vision which includes regulatory institutions among its actors.

The Technological System is based on evolutionary theory and analyzes the progress of a technology (a life cycle analysis) beginning with its birth followed by its evolution and maturity, and is focused on incremental innovation. The Technological System is defined by terms of knowledge and skills. It consists of the dynamics of knowledge and skills which may be regional, domestic or international. The organizational unit is the principal responsible for innovation (Coenen & López, 2008).

The Socio-Technical Approach is constructivist and focuses on technological transitions and radical innovations, seeking to elicit the main constituent elements of an organization that include: artifacts, knowledge, capital, and culture, etc. Innovation arises through the interaction of many processes and activities, bringing elements, networks and niches that are developed starting from the moment that they are legitimized. In other words, it reflects, starting with experimental learning, the viability of rules, cognition, and local practices that turn into the environment's formal rules and regulations (Geels, 2010).

This search for innovation begins with the institutes or sectors that influence these new projects and also are influenced, which makes innovation one of the main preoccupations throughout the world (Coenen & López, 2008). Table 2 presents the institutional concepts for these three approaches to innovation.

Institutional Theory explains innovation based on cognitive institutions that seek legitimacy so that they'll be accepted. This legitimacy constitutes a mechanism that links organizational behavior with belief systems and public opinion in which change occurs as a response to institutional pressure (Geels, 2010).

Also according to Geels (2010) the paradigms of innovation present important characteristics that can be allied to Institutional Theory. The first of these is that it possesses intentional, directed objectives and displays determinism; the second is that its benefits are for collective not individual goals, which is why it involves legitimacy and institutional pressure; the third is that they are aggregated mostly in large companies where institutional pressures are the greatest. These transitions therefore imply social interactions and constructs, the market, technology, ideas and public opinion.

Innovation is a social interactive learning process which is the result of a social construct which interacts with environmental institutions and processes, creating new currents of thought

based on environmental pressures. This approach also recognizes that certain patterns of interaction are more pronounced than others, by virtue of laws, rules, norms and routines, or in other words, by the influence of other institutions. In sum, in this theory an innovation system is defined as organizational and institutional networks and their components (Geels, 2010).

In this context, Hatch and Cunliffe (2006) introduce the importance of understanding the individual's view, how he or she interprets reality, and covers the individual's actions, interpretations of meaning, and values. In other words, the organization around innovation is a culture, exercising an active role in the development of shared interpretations of its experiences in the search for legitimacy.

To survive, organizations need to adapt to institutional expectations, even when these expectations have little to do with technical notions of performance (D'Aunno, Sutton, & Price, 1991).

In thinking of organizational arrangements in terms of actions or archetypes, Greenwood and Hinings (1996) offer a robust definition of radical and convergent change. Convergent change occurs within the parameters of existing archetypal practices. Radical changes, by contrast, occur when the organization changes from one practice to another.

Isomorphism and institutional pressures for convergence lead organizations to adopt the same institutional forms, which impose practices on each organization (Dimaggio & Powell, 2007).

The focus of Neo-Institutional Theory is not individual organizations, but a category or network of organizations, and this statement is very relevant when we consider views of innovation systems. The institutional context is made up of vertical and horizontal links between organizations and the pressures and prescriptions within this context apply to all classes of relevant organizations (Hinings and Greenwood, 1988).

The contributions of institutional theory to the theory of innovation

Institutional Theory plays a role that is convergent with the Theory of Innovation. Thus, according to Weber and Hemmelskamp (2005) various characteristics of the institutional environment tend to adapt to the appearance and evolution of sustainable innovations. It is not just new companies that follow and

develop new technologies, but also various other layers of institutions which are generally created, transformed and abandoned in the process.

In this way, these innovation systems, when faced with institutional pressures, approach innovation as their key factor, because it is situated within a given context that is influenced by multiple levels. This phenomenon in which organizations structure themselves according to the demands of the environment, reflecting a socially constructed reality is explained by Institutional Theory through isomorphic practices (Pugh and Hickson, 2004).

In terms of these practices, the role of institutions in Innovation Theory has also been thoroughly analyzed and categorized, but according to Weber and Hemmelskamp (2005) innovations and technologies can't exist without institutions. According to the definition of institutions as patterns of habitual behavior, we can see that these patterns are necessary for the existence of any productive activity. This means that the contribution of Institutional Theory in analyzing institutions and their legitimacy is important to the Theory of Innovation.

The literature of innovation, however, uses the concepts of Institutional Theory in a diffuse and heterogeneous manner in terms of its approaches, namely the Sectoral System, the Technological System and the Socio-Technical System, which justifies the approach chosen by Coenen and López (2008) for this analysis. Institutional Theory provides the basis for the systematic analysis of innovation, using theoretical contributions about distinctions between formal and informal institutions, and regulative, normative and cultural-cognitive types of institutions, as well as the different levels of institutions (Geels, 2010).

In the Sectoral Innovation System (SIS) and Technological Innovation System (TIS) Approaches, institutions emphasize the notions of informal organizations such as habits, conventions and routines regulated by social and economic life, and habitual behavior patterns that incorporate knowledge, in contrast to the structured nature of formal organizations. These regulatory institutions respect the formal rules of the game that condition behavior and regulate interactions. They determine what is and what is not permitted, and therefore are often supported by sanctions.

Institutions in this theoretical approach encompass more informal rules that they follow based on socialization processes and socially desirable expectations. They confer values, duties, and responsibilities that define what is right and what is wrong. Cognitive institutions are the rules that constitute the nature of reality and the ways in which this or that meaning is conveyed. In this sense, the forms that are institutionalized in the Theory of Innovation, explained by Institutional Theory, act as signposts and provide a deterministic view in which the market defines what organizations should do and guides their behavior, shaping the innovation process (Barbieri, Vasconcelos, Andreassi, & Vasconcelos, 2010).

As a consequence, the influence of institutions in Technological Innovation Systems is regulative and cognitive, using codes, norms and regulations for products and technologies. The Theory of Innovation presents learning as the cognitive ability to transform through imitation or reproduction, adjusting

what is expressed by users, routines and shared expectations. The Theory of Innovation states that competitors will perceive the added gains created, and will imitate the innovator. This relationship is repeated to the extent that the process of imitation is linked to the process of innovation in a sequence (Barbieri et al., 2010).

Advances, stagnation and regression in innovation systems occur due to mismatches between the evolution of productive institutions and technology. In general, there exists a mismatch between the speed of innovation in relation to speed of change in institutions. SIS and TIS can be considered systems for focused companies that are the ones mainly responsible for innovation, because they are responsible for the adoption and use of new technologies, characterized by specific beliefs, expectations, objectives, skills and organization, and are continually evolving in the process of learning and the accumulation of knowledge (Malerba, 2002). The actors in these approaches are not exclusively companies, and also include non-business organizations such as universities, financial organizations, governmental agencies, local authorities and so on, which are considered secondary actors. SIS and TIS use a wide array of formal and informal modes of cooperation and interaction between actors. The distinction between the players (organizations) and the rules of the game (institutions) has become common in most SIS studies.

Thus, institutionalization is important for organizational development, because it considers the processes of learning and changing institutional models from an evolutionary and deterministic point of view, which influences the movements of change and deals with the level of uncertainty inherent in the innovative process, thus providing a certain level of stability (Geels, 2010).

Institutions in this conception are linked to the different forms that actions and knowledge assume – which is understood as the transmission of knowledge, concepts, values, myths, rituals, theories and reports between generations – acting to reduce behavioral and environmental uncertainties and thus they bolster confidence (Strachman and de Deus, 2005).

To this theory, institutions signify the continuation of the capitalist process, or in other words, they are necessary for the continuation of progress. This theory incorporates institutional influence as a factor which orders and regulates behavior, bringing focus to the manner in which these agents perceive reality, view transformations and learn. It does not incorporate institutions in a more systematic fashion and sees things from an evolutionary perspective (Geels, 2010).

Economic explanations rely exclusively on competitive isomorphism or imitation oriented by the rational belief that this new practice will improve economic performance. Competitive isomorphism can explain the behavior of the initial adopters of a new practice, but they are not good at explaining how this practice spreads over time. According to some institutionalists, once the number of firms that adopt an innovation increase, the greater the number will be of those who adopt it in the future, especially in times of uncertainty. It is better to adopt institutional isomorphism or adopt a new practice because it's perceived as having legitimacy, even if the actual performance benefits are still uncertain (Dimaggio & Powell, 1983).

While organizational innovation can trace its origins to certain rational principles, it becomes institutionalized over time and continues to be used by organizations even if the economic benefits are not very clear. The issue is that innovation has the power to influence and create opportunities for organizations, and institutionalism is a way to explain and obtain this legitimacy (Dimaggio & Powell, 2007), leading to innovations that seek legitimacy more than improved performance, or in other words, situations where organizations adopt innovation simply to increase their legitimacy. Thus, isomorphism explains the fact that organizations mirror themselves on other organizations that they perceive as having greater legitimacy, even creating organizations that unconsciously innovate solely for the purpose of securing legitimacy.

Geels (2004) elaborates at length about the regulative, normative and cognitive dimensions of institutions. He suggests that for short-term analyses, the institutional framework should serve as a constant in relation to the strong effects of structure on actor behavior, which is very much in line with the way institutions are treated in SIS and TIS.

On the other hand, the Socio-Technical System (STS) uses the inter-organizational community as the unit of analysis, which is understood as social groups which share particular perceptions and select agendas, norms and preferences. The cognition, actions and interactions of agents are shaped by institutions which include norms, routines, common habits, established practices, rules, laws and so on. Institutions include those who impose rules on the actors as well as those who react to the interactions between them (such as contracts), and include more formal examples (patent laws or specific regulations) as well as more informal ones (traditions and conventions).

In terms of the above mentioned distinction between regimes and niches, Geels (2004) argues that existing institutional structures create a path dependence that leaves them locked into systems (or in other words regimes). Niches, on the contrary, are “places where one can escape the rules of existing regimes. The appearance of new pathways has been described as conscious deviations, in which niches provide places for this process. This signifies that rules in technological niches are less articulated and clear” (Geels, 2004, p. 912).

The effects of disruptive innovations that occur on the niche level upset the structure and the adjustments of the productive system, putting pressure on the institutions, rules and strategies of established actors. Realignment with the new environment depends on how conflicts are resolved, or in other words the adaptation skills of different actors, institutions and sectors. These adaptation skills cannot just be determined by the abilities of sectors to adapt to new technologies. They involve how the sector deals with socio-technical uncertainty over the long term and the ambiguity that emerges with new technologies and their co-evolution with structures and institutions. This process requires long-term step-by-step negotiations (Dolata, 2013).

Dolata (2013) further adds that the socio-technical constellation expands substantially through the absorption and incorporation of alternative technology opportunities. Therefore, social learning has received more attention in STS than in SIS or TIS. This is due in part to its stronger ties to sociological

theory in comparison to the pronounced economic orientation of SIS and TIS. According to Geels (2004) social learning refers to the reproduction or transformation of cognitive, normative and regulative skills through imitation or the exchange of experiences. This is manifested by the adjustments they make based on input they receive from users, routines and shared expectations. The relative tendencies in favor of technological learning (SIS and TIS) or social learning (STS) clearly have repercussions in terms of the degree of novelties that are studied.

Thus, the recognition of the cognitive aspect and the social constructivist approach, which in institutionalism means that knowledge defines the way in which an individual interprets reality, is incorporated into the Social-Technical Theory of Innovation, which also pays attention to examining the elements of the relational networks and the cultural systems which model and sustain an organization’s structure and actions.

Which in other words means that, as in Socio-Technical Institutional Theory, institutions are social structures which attain a high degree of flexibility and are composed of elements of isomorphism, which provide stability and meaning for social life, which is a socially constructed and legitimized concept. A fundamental consequence of institutional isomorphism, according to Institutional Theory, is organizational legitimacy, which is the acceptance of an organization by its external environment (Dimaggio & Powell, 1983; Meyer & Rowan, 1991).

Institutions are relevant to the conduct of innovative systems, because their interactions occur between institutions and organizations, influencing and shaping the conduct of individuals and organizations as well as the interactions between them (Tolbert & Zucker, 2006).

Institutions are the principal object of analysis for Institutional Theory, while in Innovation Theory, institutions are not the central object of analysis. It has a more evolutionary view in the Sectoral System and Technological System Approaches which focus on the development of deterministic processes, based on the relationships between institutions which search for changes and innovations in a more prescriptive process as they seek efficiency and competitiveness. It has a more social and cognitive view in the Socio-Technical System approach, in which even though institutions are not the central to their analyses, they are important to the understanding of the processes of dynamic growth, development and technological innovation. In other words, institutionalization is what defines the progress and repercussions of innovative systems in the Socio-Technical Approach (Table 3).

Tolbert and Zucker (2006) describe institutionalized innovation as “gradual legitimization,” or a cumulative level of adoption. To the authors, anticipated adoption is directed toward resolving specific problems and, in this way, it is a function of organizational characteristics. But with the passage of time, these characteristics lose their power to encourage anticipated adoption, and what explains subsequent adoption is the increase of institutional pressures, measured by the cumulative number of adopters. When innovation is not institutionalized by gradual legitimization, regional and local institutional effects appear as key factors in initial and subsequent adoption.

Table 3
The relationships between institutional theory and the sectoral system, technological system and socio-technical system approaches to innovation.

Institutional Theory and the sectoral and technological system approaches to innovation	Institutional theory and the socio-technical approach to innovation
<ul style="list-style-type: none"> - Theoretical contributions concerning the distinctions between formal and informal and regulative, normative, and cultural-cognitive types of institutions. - Signposts offer a deterministic view in which the market defines what organizations should do and guides their behavior. - Approach learning and changes in institutional models from an evolutionary view. - Incorporate institutional influence as a factor that orders and regulates behavior, focusing on the way in which agents perceive reality, view transformations and learn. 	<ul style="list-style-type: none"> - Institutions shape the cognition, actions and interactions of agents, which include norms, routines, common habits, established practices, rules, laws and so on. - Use the inter-organizational community as the unit of analysis, understanding them as social groups that share a particular perception and select agendas, norms and preferences. - In terms of long-term changes, attention should be paid to social learning and institutional change. - Recognition of the cognitive aspect and a social constructivist approach. - Pay attention to the examination of elements of relational networks and cultural systems which model and sustain an organization's structure and actions. - Cognitive structures are made up of the internalized understanding of each actor based on the interpretation of his or her social reality. - Institutions are social structures which attain a high degree of flexibility and are composed of elements of isomorphism that provide stability and meaning to social life. An institution is a socially constructed concept which seeks legitimacy through the acceptance of its norms by its external environment.

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Innovation Theory becomes more determinist and objectivist to the degree that it seeks to increase efficiency and adaptability, but it is explained by Institutional Theory to the extent that innovations go beyond the drive for improved performance and do not fall within technical task requirements, seeking instead legitimacy as a social process that is explained by isomorphism, in which institutions provide stability and meaning to human behavior as envisioned by the Socio-Technical Theory of Innovation. Institutional Theory has the capacity to explain many environmental forces that operate within organizations due to social and cultural pressure, aspects that are corroborated by the Socio-Technical Theory of Innovation.

Given this, one can argue that some constructs of Sociological Institutional Theory (Organizational Field, Isomorphism and Legitimacy) can broaden the analytical scope of the Socio-Technical Approach to the Theory of Innovation. The organizational field construct from Institutional Theory dialogs with the inter-organizational communities construct of the Socio-Technical Approach to the Theory of Innovation, to the extent that one admits the existence of relevant actors in a given social field of interaction and the concretization of what has been conditioned through socio-technical processes.

It can therefore be understood that the Socio-Technical Approach to Innovation Theory, in taking into account the organizational field, is based on the assumption that there exists contradictory logic in institutions which makes it possible to develop innovations which will or will not be incorporated into daily routines based on the legitimacy perceived by the relevant actors.

Changes in organizational fields normally occur in an incremental manner. During periods of institutional stability, legitimacy is in consonance with institutional isomorphism (Dimaggio & Powell, 2007), while in periods of institutional crisis, changes may be radical demanding innovation for reasons of efficiency aligned with competitive isomorphism (Dimaggio & Powell, 2007).

Conclusion

Institutions as explained by the Institutional Theory are important elements in the understanding of the Theory of Innovation. In this theory, institutions are social expressions and are seen as social constructs which are adaptive as well as original in a process that seeks equilibrium when faced with social pressures. An institution is a group of practices that defines the behavior of a group and possesses meaning that gives it legitimacy. Thus institutions can be envisaged as signposts in the Theory of Innovation.

In addition to improved organizational performance, innovations seek to incorporate values as organisms adapting to social pressure. The theoretical foundations of institutional theory converge in terms of the significance of institutions to the Theory of Innovation, suggesting that with the increase of interaction between organizations within an organizational field, they will reflect more and more rules that are based on institutionalization and legitimacy.

Thus, in Institutional Theory, values, beliefs, and meanings support institutions through shared interpretations, in which reality is subjective and not objective, in contrast to the Theory of Innovation which recognizes the need to adopt isomorphic forms to achieve legitimacy, but has a more functionalistic, practical and deterministic point of view. In Innovation Theory, the reading of the environment is more objective, and recognizes forces and pressures and deals with them as well as isomorphic patterns, analyzing the legitimacy obtained, but it does not give the understanding of the socially constructed reality the same emphasis that it has in Institutional Theory.

In other words, the interpretations of Institutional Theory are more similar to the Socio-Technical Approach to Innovation, even though they also bear some similarities to the Sectoral Systems Approach and the Technological Systems Approach.

The Sectoral Systems Approach and the Technological Systems Approach are similar to Institutional Theory in their interpretations of its theoretical contributions that deal with distinctions between formal and informal and regulative, normative, and cultural-cognitive types of institutions. They are also similar in their emphasis on signposts that define what organizations should do, and they offer an evolutionary view

of the processes of learning and change, incorporating the influence of institutions in ordering and regulating behavior. They are also similar in the way these agents perceive reality, view transformations and learn.

Institutional theory is more broadly similar to the Socio-Technical Approach to Innovation due to its emphasis on how the cognition, actions and interactions of agents is shaped by institutions including norms, routines, common habits, established practices, rules and laws. Both use the inter-organizational community as the unit of analysis, understanding them as social groups that share a particular perception and select agendas, norms and preferences.

There are also similarities between Institutional Theory and the Socio-Technical Approach to Innovation in terms of long-term change, with attention being given to social learning and institutional change, recognizing its cognitive aspects and a social constructivist approach. Both pay attention to the examination of elements of relationship networks and cultural systems which model and sustain the structure and actions of an organization, in which the cognitive structures are constituted by the internal understanding of each actor, based on the interpretation of his or her social reality.

In this way, in both theories it is institutionalization that defines the progress and repercussion of innovative systems. Normative obligations enter social life before facts, and the diffusion of innovation only occurs when norms are accepted by the external environment. Institutions are social structures that attain a high degree of flexibility and are made up of elements of isomorphism which provide stability and meaning to social life, a concept that is socially constructed and legitimized.

One of the principal contributions of this study, besides its exhaustive study of the main constructs of Institutional and Socio-Technical Theory and their proximities, similarities and differences, is the inference of how innovation can be affected by institutional factors. In other words, the Socio-Technical Approach to Innovation in valuing the organizational field construct can amplify its analytical scope, because innovation can occur due to incremental or radical institutional changes. These differ in the extent of change, the path followed and/or the rationale constructed.

In the former, innovation occurs through incremental change by a series of small challenges to what is accepted as true, correct, just and legitimate. Here, therefore, the concept of the organizational field rules with the logic of institutional isomorphism and its coercive, mimetic and normative mechanisms (Dimaggio & Powell, 2007). In the latter, innovation occurs through radical change, because new socio-technical processes, which are oriented toward economic efficiency and competitive isomorphism, have the opportunity to become dominant when there is an unstable environment due to institutional crisis (Dimaggio & Powell, 2007).

Conflicts of interest

The authors declare no conflicts of interest.

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