Theorizing Technological Adaptation as a Trigger for Institutional Change

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THEORIZING TECHNOLOGICAL ADAPTATION AS A TRIGGER FOR INSTITUTIONAL CHANGE

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Abstract

Institutional pressures and technological adaptation have frequently been expressed as contrasting forces that explain organizational processes and actions. Institutional arguments suggest that environmental pressure, deriving from regulative, cognitive, and normative forces predict organizational action (or inaction), and impel organizations to favor legitimacy over efficiency. Theories addressing the use of technology view technological adaptation as the organization’s response to competitive and efficiency demands. We argue here that structuration theory, by incorporating a temporal dimension, reveals an important intersection between institutional theory and a theory of technology use. Specifically, we develop a theoretical model that reveals interactions between technology, organizations, and institutions. Further, we suggest that institutional forces and technological adaptation are related by virtue of their common structurational foundations, within varying, but interrelated, time scales, and that both impact organizational behavior. In doing so, we seek to develop a hybrid theoretical perspective integrating the fields of organizational theory and information systems with the hope that it suggests new ways of analyzing technological and organizational change.

1 INTRODUCTION

Institutional forces and technical rationality have often been expressed as opposite ends of a spectrum of pressures that guide and explain organizational behavior (Kraatz and Zajac 1996). Organizations in highly institutionalized fields are thought to obey socially constructed definitions of appropriate ways in which to organize to gain and maintain legitimacy. In contrast, technical and economic rationality are viewed as models for explaining organizational behavior by way of the rational, efficient choices that are made by empowered management agents (Meyer and Rowan 1977). Yet, despite these differences it appears that theories of institutionalization and technological adaptation in fact intersect; firms in highly institutionalized environments do change in technically adaptive but institutionally illegitimate ways (Kraatz and Zajac 1996; Oliver 1992). In an attempt to extend this literature, we develop a conceptual framework that relates time scales, technology-organization relations, and technological adaptation, and suggests that technology is a relevant yet under researched trigger of institutional change. We attempt to develop theoretical arguments which shed light on the following questions: (1) How and why do technologies become institutionalized within firms? (2) How and why do technological adaptation processes within organizations lead to institutional change?

The remainder of this paper is divided into three sections. We begin by explaining the concepts and definitions of structuration, institutions, technology, and time as foundations for model and proposition development in the next section. Discussion of the model in section three will draw on the specific example of the technological adaptations occurring in higher education to illustrate otherwise generalizable arguments. We conclude with important implications of our model.
2 CONCEPTUAL DEVELOPMENT

2.1 Structuration Theory

Giddens (1986) provides a theory for viewing the rules and resources that humans use in their everyday interactions and emphasizes that these structures both control human action while at the same time human action serves to produce and reproduce these structures or institutions. This “duality of structure,” as proposed by Giddens, overcomes the limitations of viewing the objective, structural features of organizations independent of the subjective, knowledgeable actions of human agents (Barley and Tolbert 1997; Orlikowski 2000).

Giddens focuses on three dimensions in bridging the two perspectives of human action and institutions (as structures). Structures of signification represent organizational rules that define appropriate interactions and form the basis of the development of shared meaning in organizations. Structures of domination reflect the asymmetrical power relationships in organizations delineating the ability of individuals to accomplish outcomes. Structures of legitimation govern the norms or appropriate conduct of actors in organizations and define what is legitimate. Prevailing cultural norms dictate interaction and guide the use of normative sanctions to sustain rituals, social practices, and traditions. Meaning (signification), power (domination), and norms (legitimation) are elements of social interaction which humans create and re-create in organizations, because of interpersonal interactions. Ultimately, these structures represent the organizational level institutional context and are derived from the cumulative history of action and interaction: “To the degree that institutions are encoded in actors’ stocks of practical knowledge (in the form of interpretive schemes, resources, and norms adapted to a particular setting…), they influence how people communicate, enact power, and determine what behaviors to sanction and reward” (Barley and Tolbert 1997, p. 98).

We suggest these elements are compatible with institutional structures suggested by institutional theory.

2.2 Structuration and Institutional Theory

Organizations in highly institutionalized fields are guided by the externally generated taken-for-granted assumptions, values, and norms of their institutional environment, irrespective of the technical rationality of their actions (DiMaggio and Powell 1983; Meyer and Rowan 1977). In institutional theory, regulative, cognitive, and normative structures act on organizations and serve to constrain their behavior through distinct control mechanisms: coercive, mimetic, and normative pressures (DiMaggio and Powell 1983). Regulative structures stem from authority and regulations that are more formal. Cognitive structures arise from rules that specify what roles, procedures, and actions are allowed to exist. Normative structures arise from legitimated professional practice (DiMaggio and Powell 1983). Institutional theorists argue that these norms and rules are socially constructed by individuals through a history of their interactions which lead to shared typifications (Meyer and Rowan 1977). Over time these shared typifications transcend individual, and even organizational boundaries, and therefore exist at the level of the environment. Thus, consistent with structuration theory—although at a higher level of aggregation—institutional theory exhibits a dualism whereby institutions arise from social interactions while at the same time they constrain social action (Barley and Tolbert 1997). These forces limit choice to those behaviors that enable the firm to gain or retain legitimacy resulting in isomorphism (DiMaggio and Powell 1983; Meyer and Rowan 1977; Zucker 1977). The more mature the field and the greater the institutional pressures, the greater the similarities among organizations (DiMaggio and Powell 1983).

Originally institutional change was conceptualized as unidirectional (toward less variation among organizations in the organizational field). Subsequent empirical studies have examined the nature of institutional change to account for firm differences. For example, Greenwood and Hinings (1996) noted that radical change in institutionalized settings is promoted when industries are permeable to ideas from other industries, when fields are characterized by a lack of consensus on ideology, and when powerful interests have values congruent with the changes. While providing important contributions to understanding institutional change, these studies rarely detail processes of institutionalization, which early institutionalists characterized as processes of social construction (like structurational processes). Further the role of technology and its influence on institutional change has not been considered. Yet, we believe technology is an important trigger of institutional change that warrants further attention.

2.3 Structuration and Technology

Research on technology and organizations has a long history (Perrow 1967; Thompson 1967). Nevertheless, theorists have struggled with the complexity of the technology construct, as well as the level of analysis at which to examine it. This has resulted in a selective focus on different dimensions of technology, thus leading to a fragmented, noncumulative literature (Orlikowski
very long periods of time. Momentary individual actions to the creation of social norms, habits, and taken-for-granted structures that define institutions over institutions that we study. It also justifies the examination of institutionalization processes across multiple levels of analysis, from the scope of this paper to examine this issue in detail. For our purposes, it is sufficient to note the time dimension inherent in the interactions that served to define the institution. Institutions embody time. This perhaps explains the dearth of empirical research have before us, that both institutions and institutional pressures are infused with history—the history of the repeated actions and activities become legitimated and self-perpetuating, assuming a taken-for-grantedness and rule-like status that renders them difficult to change. Although often not explicitly recognized, time is an inherent dimension of institutions. We argue, as others have before us, that both institutions and institutional pressures are infused with history—the history of the repeated actions and interactions that served to define the institution. Institutions embody time. This perhaps explains the dearth of empirical research examining when institutions start and stop, as well as the greater focus on how they endure or slowly change. It is beyond the scope of this paper to examine this issue in detail. For our purposes, it is sufficient to note the time dimension inherent in the institutions that we study. It also justifies the examination of institutionalization processes across multiple levels of analysis, from momentary individual actions to the creation of social norms, habits, and taken-for-granted structures that define institutions over very long periods of time.

While providing valuable insights, research on the technology-organization relationship has overlooked important micro processes. Specifically, researchers have given little attention to how the material aspects of technology interact with the individual implementation choices and actions of human agents. This is because previous research has examined an undifferentiated concept of technology that includes multiple dimensions (Orlikowski 1992). Relying on Giddens’ view of structuration, technology researchers have suggested that “technology embodies and hence is an instantiation of some of the rules and resources constituting the structure of an organization.” (Orlikowski 1992, p. 405). More recently this work has been extended to emphasize the notion of emergent structures (versus embodied) and user enactment (versus appropriation) as more accurate representations of technology in use and the structuration of technology through human agency (Orlikowski 2000). This work depicts technology as physically constructed by actors while at the same time being socially constructed by actors through the different meanings they attach to it, the different features used, and their organizational context. It therefore allows us to distinguish between the role of material features of the technology and the role of human actors in designing and using it. The interaction of users with the material properties of technology and the social context of the organization provide a role for technology in the alteration of structures of meaning (signification), power (domination), and norms (legitimation). Thus the adoption and use of technology can have intended and unintended consequences for the organization and for individuals within because the material properties of technology can be mobilized by users in a variety of ways (including not using it) and may undermine and transform rules and structures enacted by users thereby changing institutional contexts (consisting of structures of legitimation, domination, and signification). These relationships are thought to vary in strength over time, creating tension in the system and giving rise to either conformity or change. The implications of this model for technology research in organizations are three-fold: Theorists need to consider (1) both the physical and historical contexts of technology, (2) the enactment of technology by organizational members, and (3) the potential for technology in use for reinforcing or changing institutional properties at an organizational level.

2.4 Time Scales and Temporal Boundaries in Theory

In contrast to institutionalization, which is typically conceptualized over relatively great time frames (cf. Tolbert and Zucker, 1983), technical adaptation at the individual or firm level is typically viewed as occurring in relatively short bursts (Tushman and Anderson 1986). This crossing of multiple conceptions of time and temporal boundaries between technological adaptation and institutional theory suggests the need to consider the time dimension further as suggested by recent research. Specifically, Zaheer et al. (1999) comment that consideration of time scales in theory development “may change the meaning of concepts or the relationships between them” (p. 734). We define time in our investigation as the period in which a phenomenon exists. This coincides with Zaheer et al.’s notion of the existence time scale of a theory. Further, we define the notion of temporal boundary as the limit of a theory’s applicability within an explicitly recognized temporal dimension (Zaheer et al. 1999). These definitions will be used to reflect on the dimensions and definitions of time that are inherent or explicit in both the institutional and technological view of the organization.

Explanations of institutional pressures hold that over long periods of time, the habits and traditions associated with organizational activities become legitimated and self-perpetuating, assuming a taken-for-grantedness and rule-like status that renders them difficult to change. Although often not explicitly recognized, time is an inherent dimension of institutions. We argue, as others have before us, that both institutions and institutional pressures are infused with history—the history of the repeated actions and interactions that served to define the institution. Institutions embody time. This perhaps explains the dearth of empirical research examining when institutions start and stop, as well as the greater focus on how they endure or slowly change. It is beyond the scope of this paper to examine this issue in detail. For our purposes, it is sufficient to note the time dimension inherent in the institutions that we study. It also justifies the examination of institutionalization processes across multiple levels of analysis, from momentary individual actions to the creation of social norms, habits, and taken-for-granted structures that define institutions over very long periods of time.
Technology choices in organizations are associated with the attendant demands for efficiency and effectiveness in firm performance (Kraatz and Zajac 1996; Orlikowski 1992). This is so regardless of how the technology-organization relationship is conceptualized. Time is considered at least implicitly in this perspective by virtue of the fact that time, and more specifically speed and quickness, are inherent in the concepts of efficiency, profit, return on investment, time to market, and other desirable outcomes espoused by notions of technical rationality (Adam 1995). The notion that “time is money” is revealed in models of technology adaptation and outcomes, and the temporal boundaries of this viewpoint generally coincide with relevant business cycles, both measurable cycles such as years and constructed cycles such as product development life cycles. On that basis, and given the common dimensions of structuration outlined above, we consider technological adaptation cycles to occur as nested time scales (Zaheer et al. 1999) within the relevant institutional field and this will be reflected in our model development.

In summary then, we propose an integration of institutional theory, the structuration of technology, multiple levels of analysis, and temporal boundaries in theorizing technology as a trigger for institutional change. We suggest environment level cognitive, regulative, and normative structures such as taken-for-granted ways of organizing, government agencies, and social norms of behavior to guide and constrain organizational level structures. Concurrently, these environment level institutions are shaped by, and serve to shape, the shared meaning, power relations, and organizational norms that are organizational level institutions. Individuals both create, and are constrained by, organizational level institutional structures in their everyday actions. These include how they communicate, use power, and determine what behaviors to reward or sanction. We suggest that no single individual action is capable of creating change at either the level of organizational or societal institutions. However, we propose that the ongoing action and interaction of individuals over long periods of time, while being constrained by higher levels of institutional structure, can also serve to modify these structures. This occurs when some phenomenon or occurrence triggers both individual level action and interaction, resulting in deviations from existing structures. Technology can serve as one triggering mechanism and we explore this potential next.

3 MODEL DEVELOPMENT

To further our theorizing, it is necessary to undertake the integration of technology into a model incorporating levels of analysis across temporal boundaries. In this section, a new model of the structuration of technology is developed, combining multiple levels of analysis utilizing technology features as triggers for the social construction of technology (Griffiths 1999). Features, or the material aspects of a technology, are the point at which individual sense-making and social construction begins. Further, they are the elements of technology as a whole that are subject to state of the art improvements over time (Griffiths 1999). Therefore, extending the model of technology features as triggers for sense-making (Griffiths 1999), Figure 1 incorporates elements of the above discussion and represents our preliminary attempts to theorize about the institutionalization of technology within an organization and its impact on institutional change at the level of the environment. The balance of this section will discuss this model with respect to the impact of technological change and institutional theory and will illustrate its use.

The phenomenon of the adoption of virtual courses and virtual degrees in universities reveals a way in which to integrate the concepts discussed above and serves to better illustrate the application of our conceptual model. University environments continue to be seen as highly institutionalized fields (Kraatz and Zajac 1996). Yet, the altering of the institutionalized technology of face-to-face course delivery to course delivery through virtual technologies affords an opportunity to examine technically adaptive but institutionally illegitimate change. Here we use the developed view of technology and institutional pressures to describe what may be happening and why.

Universities are ideal settings within which to examine the proposed model since they operate in a highly institutionalized field. The model of universities, what they are and how they are to perform, is very familiar to most people, constituting a widely shared cognitive view (Kraatz and Zajac 1996). Almost without exception, universities have been seen as familiar, brick and mortar-based organizations. Further, there has been a widely held normative belief that universities provide a valuable educational experience for which the students must be physically present. Beyond the academic function of universities, universities are recognized as serving as a tool for the socialization of young adults, and this requires students to be physically copresent (Duderstadt 1997; Fornaciari et al. 1999).

More recently the university environment has experienced significant changes due to economic pressures and changing societal values. In addition, significant pressures have been brought to bear on the institutional environment of universities by advances in technology. Advances in communication and groupware technology, the advent and accessibility of the Internet, and the demand for continuous learning among working adults have resulted in significant growth in alternative modes of delivery (Rudich 1998). Specifically, development of online education—defined here as university courses and degrees which can be obtained through completion of virtual course work (no classroom or face-to-face contact)—has raised considerable debate. This environment, therefore, affords an excellent opportunity to consider the model developed in Figure 1.
The diagram illustrates three levels of analysis: the institutional level, the organizational field level embedded in it, and the individual level of technology use and outcomes embedded in organizations. These levels coincide with the environment and organization level institutions and the role of the individual in enacting (or altering) structures through their use of technology. At the institutional level, we view the state of the art of technology advancing within the constraints imposed by institutional structures: what is sanctioned by regulation, funded, and deemed socially acceptable (A). The state of the art technology becomes a technical system within an organization through design choices made by technically rational decision-making processes by the organization (B). The state of the art technology has features that are known and intended. Importantly, the technology may also contain unknown features that can be discovered and used through design choices, and through human interaction with the technology.
Design choices will, in part, reflect the institutional character and historical context of the organization for which they are developed (e.g., Barley 1986). These institutional contexts served to shape the design choices made with respect to who would operate the technology and how it was to be used. Technical systems are then socially constructed by users through structures of meaning, power, and norms institutionalized within the organization, and resulting in particular organizational processes and outcomes (C). Again, because technical systems contain both known and unknown features, they can be used differentially both within the focal organization and between organizations within the same organizational field. This view supports the position that technology is a heterogeneous variable among organizations (Sproull and Goodman 1990). Further, it is argued that those actors outside the organization, including other firms and society, influence the social construction and use of technology within the focal organization (D). These extra-organizational actors are subject to the same process of making use of state of the art technology. However, because of the social construction of technology, these extra-organizational actors may make differential use of the technology and thus influence the focal organization. This influence manifests itself through the extra-organizational institutional pressures that both act on and affect organizational choices and actions (as depicted by the organizations, nested in the organizational field, within the institutional level of analysis).

More specifically, technical systems as developed by designers contain known and unknown features. These features are characterized by two attributes of their nature: (1) concrete or abstract and (2) core or tangential (Griffiths 1999). During the introduction of a technology, individuals using the technological systems are faced with the task of making sense of the technology, within the context of organizational structures, based on the degree to which it triggers certain interpretive schemes. The degree to which the technology is seen to be novel, or discrepant (between expected and observed features), or to require deliberate initiative to understand triggers sense-making and social construction activities on the part of the user (Griffiths 1999; Weick 1990). These activities are influenced by both the attributes of the technological system’s features and the institutionalized structures of the organization (Orlikowski 1992). During this process individual users may create new features which become part of the organizational process. Thus, Griffiths has observed that “Any technology is a combination (constellation) of features: distinct parts, aspects and qualities. Features that are noticed by users can then be socially constructed into an organizational system” (p. 476). Within the context of an organization, over time, the regular action of users of the technology attains standardized practice, which becomes the institutional structures of meaning, power and norms within that organization (E).

These arguments lead to our first, most fundamental proposition:

**Proposition 1:** Over time, technical systems in organizations become institutionalized within that organization.

While we have described how technology becomes institutionalized within an organization, we contend that these same forces act on organizations and individuals that reside beyond the boundaries of the focal organization. This is important since it implies that the focal organization will also be guided in its social construction by interactions it has with extra-organizational actors (other firms or people).

Using the developed view of technology and institutional theory in Figure 1, we argue that an additional environmental force—technology—acts to create institutional pressure in and on organizations. As depicted in Figure 1, institutional pressures are an essential component of the environment within which organizational behavior is interpretable. However, the conceptual model shows how technology becomes an additional (rather than opposing) influence within institutional theory. Organizations select from state of the art technology to create technical systems. Once introduced into the organization, these technical systems create opportunities for social construction and structuration. These processes influence organizational decisions and actions. Externally, regulative, normative and cognitive institutional forces influence both the technology and technical systems designed. At the level of technology in the environment, institutional pressures bear on the state of the art and form the basis for identifying (recognizing) known features. At the level of the technical system, organizational members will make design choices based on institutional pressures (those within the firm and external to the firm). This is one mechanism by which technology, at the level of the environment, comes to influence organizational decisions and actions.

Simultaneously, because technology has known and unknown features, it can lead to unpredictable, varying behavior in firms. As the technology becomes structured within the firm, it may take on unintended forms and uses due to the unique firm-level contextual factors with which it interacts. Over time, as a technical adaptation is absorbed through the process of structuration, technological systems become institutionalized within the organization and may come to be viewed as legitimate by external constituents. Thus, organizations conform to and retain certain technological designs to gain legitimacy rather than for purely rational efficiency reasons. This leads to propositions 2 and 3:

**Proposition 2:** Change in the state of the art technology create the possibility of technical adaptation within firms.
Returning to our example in higher education, the development of online delivery is characterized first by advances in the state of the art technology. Since the late 1970s and early 1980s, new features made available by advancements in communications technology and groupware created an opportunity for universities to introduce technology into the classroom. At first, these technologies were merely a tool to support the classroom delivery of material. Concurrently, university involvement in distance education developed as economic pressures and social changes mounted for universities to attend to wider audiences (Duderstadt 1997). Traditionally these distance courses were developed and delivered in individual formats with the student working alone. These early activities did little to disrupt or influence the institutional order of face-to-face classroom formats.

However, in the early 1990s with the advent of the Internet and growth in home ownership of personal computers, universities began to adapt their distance education course offerings to take advantage of the new technologies and to enrich the learning experiences of distance students (Duderstadt 1997; Fornaciari et al. 1999; Ives 1994). We suggest that these early experiences, combined with early technical adaptations to automate and use technology in the classroom, established a fundamental change in higher education: the university level institutional view of course delivery, previously physical colocation in the classroom, was altered to include virtual delivery of courses and now includes online degrees. For instance, in 1995, there were 75 accredited colleges and universities in the United States offering online degrees. Additionally, over the last 5 years, prestigious (i.e., legitimate) institutions such as Stanford, Harvard, Duke, and University of California, Los Angeles have developed online “products”—degree program courses (O’Leary and Fischer 1998). These statistics reveal the degree to which these technical adaptations have, over time, influenced the institutional norm of education delivery exclusively in face-to-face classroom settings.

As institutional forces provide the framework within which technical systems are used in organizations, technology and technical systems loop back to cause changes in institutional pressures (F and G). Over time, as new technologies penetrate the organizational field, their intended and unintended consequences resulting from social construction may begin to alter institutional norms and the definition of legitimacy (Kraatz and Zajac 1996). As individuals discover and create new features around the technical system, these systems and individuals’ adaptations to them may challenge institutional norms and values. Over time, these technical adaptations serve as antecedents to institutional change. Given the differing time scales of the two phenomena, it is useful to picture these influences as multiple gears in a large clock with technical adaptations represented by smaller gears making faster rotations, and institutional pressures representing larger gears, making slower rotations. Over time, many technical adaptations may ultimately and incrementally influence the movement of the larger, slower moving institutional pressures. Thus, we suggest:

**Proposition 4: Technical adaptations across firms in the environment are precursors to changes in institutional pressures at the level of the environment.**

Firms within an organizational field may not immediately progress toward homogeneity during periods of technical adaptations. This results from (1) the differential effects of the social construction of technology on firm behavior and (2) the different time frames within which the technical adaptation and institutional change mechanisms occur. Since the state of the art in technology is advancing (and at different rates in different time frames), firms may be adapting technical designs incrementally. However, as we have suggested, even small changes in technical systems can create complex interactions within the firm and may serve to recreate firm level institutional technologies. Eventually, new institutional norms and definitions of legitimacy emerge from the changes wrought by technological adaptation within the firm, within the organizational field, and by society at large. Thus, the social construction of technology, despite being embedded in a particular institutional field, serves as a mechanism for difference and change in organizations and in institutional pressures. Consequently, during such transformations, as repeated technological adaptations ultimately change institutional norms, firms will appear to be changing in technically adaptive but institutionally illegitimate ways.

Finally, institutional theorists have typically implied that the various institutional pressures in an organizational field are not at odds with each other (DiMaggio and Powell 1983). However, we suggest that, during periods of technical adaptations in which institutional norms of legitimacy within and outside of the organization are changing, these forces may be incompatible with each other. During such times, it is expected that conflict between normative, coercive, and mimetic pressures will exist with some pressure toward maintaining existing standards of legitimacy and other pressures supportive of change. For example, we have recently observed a notable increase in the for-profit higher education sector. Based on the previous arguments, we propose:

**Proposition 5: In institutionalized environments, where the state of the art technology is changing, technical adaptations will serve to create a period of greater heterogeneity and conflict between institutional actors (the state, the professions, and society) before settling into new periods of isomorphic change.**
In the university setting, the technical adaptations considered provide evidence of this conflict as online education has produced heated debate. At the University of Washington, 900 academics signed petitions against electronic education. At the University of California in Los Angeles, only 30 percent of the faculty complied with an instruction to post their courses on the Internet. At Drexel University, the debate over how copyright issues should be dealt with has been strong (Young 1999). In contrast, there has been increasing interest and support for these changes in society and in other organizational fields. John Chambers of Cisco Systems exemplified these contrasting views when he commented: “The next big killer application for the Internet is going to be education. Education is going to be so big it is going to make e-mail look like a rounding error” (Friedman 1999, p. A15). Potential and current students of Internet based courses and industry players have generally been very receptive to this new delivery mode of education and are driving the demand for greater access and variety (Friedman 1999). This observation supports our argument that, during periods of technical adaptation and institutional change, the drivers of institutional pressure toward isomorphism (e.g., society, the professions, and the government) will disagree about what is (il)legitimate change and this conflict will persist until legitimacy is won by one faction or another.

4 CONCLUSIONS

The relationship between technology, organizations, and the environment has been explored in this paper from the perspective of structuration and the impact that technology has on institutional fields. We explored answers to the questions of how and why technologies become institutionalized within firms and how and why technological adaptation processes within organizations lead to institutional change at an organizational field level. We suggested that the answers to these questions may start to be revealed by considering the varying time periods (and scale) over which technological adaptation and institutional change occur.

At the level of environment, technology exists as the state of the art features and functions available at a particular time within some institutional context. Technical adaptations occur in organizations as they create technical systems within firm level institutional constraints, while selecting from the state of the art technology. Once introduced into the organization, technical systems occasion opportunities for structuration and create sometimes subtle and sometimes profound changes in the institutionalized practices within the organization.

External to the organization, as members in the organizational field and society engage in technical adaptations in the development of their own technical systems, their development of technical systems is impacted by existing institutional pressures. At the same time, the collective outcomes of the technical adaptation process, over time, serve to alter institutional pressures and definitions of legitimacy. In this way, technical adaptations are governed by institutional pressures and also serve as engines for institutional change.

During periods of transition in institutional norms and standards, conflicts will exist between institutional actors (society, the state, and the professions). Uncertainty regarding future institutional standards will arise during this stage of changing institutional forces. It is during these periods of institutional disequilibrium that organizations, making technical adaptations, may be seen to undertake illegitimate change. Over time, as the pace of technical adaptation slows in a particular organizational field, isomorphic processes and convergence, as commonly conceptualized by neo-institutional theorists, will follow these periods of heterogeneity in firm behavior. Thus, we conclude this paper with a return to our earlier metaphor of a clock - to reiterate, we see technical adaptations as represented by smaller gears making faster rotations, and institutional pressures as represented by larger gears, making slower rotations. We believe that by recognizing the impact of the differing time scales of technological and institutional adaptations, theorists may reorient their models to consider the potentially powerful impact of technological change on definitions of organizational legitimacy.

5 REFERENCES


