Coherence and persistence:  
A new perspective on legitimacy

Steve Kahl  
University of Chicago, Graduate School of Business  
5807 South Woodlawn Ave.  
Chicago, IL 60637  
steven.kahl@chicagogs.edu

JoAnne Yates  
MIT Sloan School of Management  
50 Memorial Drive, E52  
Cambridge, MA 02142-1347 USA  
jyates@mit.edu

October, 2008

Please do not distribute without permission from the authors

Abstract

We analyze the history of the insurance industry’s categorization of the computer to challenge implicit assumptions about legitimacy. We show that a new category can be legitimated without a full understanding of the category’s boundaries and legitimation does not entail taken for grantedness or implicit rule following. Based on these insights, we develop an alternative conceptualization of legitimacy. Legitimacy is not about defining new rules and then implicitly following them, but is expressed in terms of a category cohering with the existing categorical system and persisting when applied to evaluate new cases. We explore the implications of this view for organizational theory and argue for increased attention to these epistemic issues embedded in market activity.
Legitimacy plays a crucial role in sociological theories of organizational behavior. Organizations that are perceived not to be legitimate often suffer economic penalties, lowering their survival rates or relative performance (Carroll and Hannan 2000; Carroll and Swaminathan 2000; Zuckerman 1999). Legitimate rules, in turn, become the blueprint for organizing even if these rules are not economically efficient (Dobrev, Ozdemir and Teo 2006). Organizational research as diverse as neo-institutionalism and population ecology have converged on the idea that legitimacy entails adhering to conventionally held norms and beliefs (Scott 2000). Recent contributions have clarified the concept of legitimacy by further specifying this adherence in terms of fitting into the categorical schemas market participants use to interpret market activity. Organizational theory is beginning to frame economic markets as a process of social exchange in which an audience (customers and critics) evaluates candidates’ offerings (organizations and their products) (Hannan, Polos and Carroll 2007; Hsu 2006; Zuckerman 1999). To make these evaluations, audiences invoke a broader taken-for-granted categorical system that lumps market objects into distinct groups. For an offering to be legitimate, it must be classified within the audience’s categorical system.

Implicit within this conceptualization of legitimacy are core assumptions about how market participants create and use categorical systems to evaluate offerings. This view presumes that legitimacy requires collective agreement about the essential characteristics that define the category (Cattani et al. 2008). If the category lacked consensus about its membership, it could not be selective. In addition, this view does not provide an account of how market participants apply these rules and categories. Rather, the taken for grantedness of legitimate categories assumes that market actors simply follow the conventionally agreed upon meaning (Berger and Luckmann 1966; Hannan, Polos and Carroll 2007). As a result, the normative power of
legitimacy comes from the legitimation process and the implicit application to evaluate new cases.

Critics of this view of legitimacy have long argued that it does not adequately address how a category could be delegitimated (Davis, Diekman and Tinsley 1994; Strang and Macy 2001; Tolbert and Zucker 1983). If part of legitimacy is this taken-for-grantedness, how can what is legitimated ever change, decay, or disappear? Responses to these criticisms generally hold on to these assumptions while explaining change as a social process that explicitly changes the underlying definitions of the audience’s categorical system. For example, institutional entrepreneurs or enthusiasts actively manipulate categorical boundaries or help define new categories (DiMaggio 1988; Lounsbury and Rao 2004). While these strategic actors may be the source of the change, they do not explain the change itself. Since organizational theory privileges the audience’s classificatory logic, a more complete account of change addresses how its schema changes. And, considering that the audience is supposed to be taking these scripts for granted, it is not clear how this change will occur. While explicit categorical activity may explain the initial legitimation, it seems at odds with the implicit application of legitimated categories.

Given these concerns, we believe it is necessary to test these basic assumptions about the necessary requirements for legitimation and the application of legitimated categories. In this article, we analyze the history of how the U.S. insurance industry came to understand and legitimatize the computer category from 1947 – 1960s to see if these assumptions hold. The introduction of the computer is a case of a new product up for adoption that has not been previously categorized, allowing us to observe how the insurance industry, the audience, integrated the computer to its existing categorical schema. Over time, the computer became a
legitimate category, which also enables us to further observe how the insurance industry applied the category. Our analysis reveals that the insurance industry did not go through a process of defining the membership characteristics of the new product category; rather, they fit the computer into its existing categorical scheme by aligning it within its relational structure primarily through the use of analogies. It established the computer did similar kinds of things as other types of categories, such as tabulating machines, calculators, and even human decision makers. The insurance industry legitimatized the computer without fully understanding what it was in the sense of collectively agreeing upon its essential characteristics. Moreover, our analysis shows that despite this conceptualization of the computer prior to its commercial release, insurers varied significantly in how they applied the computer. The actual use of the computer helped verify and change some of the implicit beliefs about the computer, suggesting that organizational theory needs to more clearly disentangle legitimation of a category from following the legitimated category.

The intent of this paper, however, is not to argue that legitimation more generally follows the process observed in the insurance industry. Methodologically, it is difficult to generalize from the idiosyncrasies of a historical case, and the literature has identified other paths to legitimation. Instead, our analysis suggests that organization theory needs to relax these assumptions and re-conceptualize legitimacy in such a way that it embraces these different legitimation processes while still preserving its normative implications. Rather than defining legitimacy in terms of categorical membership, we define it more broadly in terms of being coherent with the broader categorical schema. Coherency makes more explicit the role of the relational structure between categories in the legitimation process as evident by the use of analogies in the computer case, while also allowing for the traditional view of the social
construction of new categories. Coherency also shifts the normative power of legitimacy from membership at the categorical level to the audience’s application of the entire schema, categories and their relations, to evaluate candidate’s offerings. Moreover, a category may become less coherent within a categorical schema through the audience’s very application of the schema to interpret a new instance. To the extent that the category persists in the face of these challenges, it maintains it legitimacy. As a result, we disentangle legitimation and the application of categories but do not privilege one as more primal than the other. Legitimacy is not about defining classification rules and then implicitly following them, but is expressed in terms of a category cohering with the existing categorical system and persisting when applied to evaluate new cases.

The paper’s argument is structured as follows. First, we derive the current assumptions about the necessary requirements for legitimation and the application of legitimated categories. We then present the conceptual history of how the insurance industry legitimated the new computer category and used the category. We then use the historical record to show that these assumptions are too restrictive. Finally, based on these insights we develop an account of legitimacy based upon how a category coheres with and persists within the categorical system. Finally, we identify implications of this alternative view for organizational theory.

**Current Assumptions about Legitimacy**

Organizational theory has taken a decidedly cognitive turn in explaining organizational and market behavior. Neo-institutionalism distinguishes itself from older versions of institutionalism based on its focus on the development and application of scripts, schema, routines, and classifications to rationalize behavior (DiMaggio and Powell 1983; Scott 2000).
Similarly, recent extensions of ecology have focused on the role that cognitive categories play in promoting organizational inertia within markets (Dobrev, Ozdemir and Teo 2006; Hannan, Polos and Carroll 2007). Collectively, these views characterize markets as embedded with these cognitive schemas and logics which actors use to make sense of market activity. These theories, in turn, follow Weber in conceptualizing legitimacy as adhering to prevailing categorical schema used to make these evaluations. This naturally leads to the question of what does this adherence entail.

Only recently has theory, in particular ecology, begun to rigorously answer this question. Ecologists define adherence at the categorical level in that sense that fitting in means that the particular offering is a member within a category (Hannan, Polos and Carroll 2007). Cases where the offering does not fit within an existing category requires the creation of a new category, which is difficult and incurs significant economic and social cost. Failure to have membership within a category results in skepticism from the audience or in more extreme cases ignorance (Zuckerman 1999). Thus, part of the normative teeth of legitimacy comes from the classificatory power of the categorical system, in particular a clear sense of what belongs within particular categories and what does not. For instance, in niche width theory, firms can take on a more ambiguous generalist position when the market classificatory logic is not well defined, but as it increases in its demarcation, a more specialized position that is consistent with market categories increases performance (Carroll 1985; Carroll and Swaminathan 2000). This view raises another important question – what determines membership within a category?

Categorical membership is no trivial matter given the complexity of objects that need to be classified. In the footsteps of Wittgenstein and cognitive psychology, ecologists recognize that category members do not all share the same characteristics; rather, members share some
characteristics with some members and different features with others (Hannan, Polos and Carroll 2007). This observation seems particularly relevant to economic market categories because competition dictates some level of differentiation among the instances within a category. For example, cars vary along several dimensions such as interior comfort or engine type, but there still is some sense of what a car is. Given this variation, what defines a category is not immediately obvious. Organizational theory contends that the membership rules are socially constructed through a process that often is contentious and political (Johnson, Dowd and Ridgeway 2006). Powerful actors may influence which characteristics of the category matter in determining membership (Lounsbury and Rao 2004). Yet, it is not until collective agreement is reached about these essential characteristics that a category has legitimacy and conditions future behavior: Institutionalists argue that “Only when symbolic boundaries are widely agreed upon can they take on a constraining character and pattern social interaction in important ways (Lamont and Molnar 2002, pp. 168-9).” Thus, an important part of legitimation is making explicit what the category is:

Assumption 1: Legitimacy entails membership within a category, and to determine categorical membership requires collective agreement over what essential characteristics define the category.

In the spirit of categorization, we may call this view “social essentialism” to highlight the belief that legitimate categories require the social identification of what belongs in it, even though objectively there is no essential characteristic of a category.

Another important aspect of legitimacy is the application of these categories to evaluate new offerings. Current theories express the application of a category in terms of evaluators
applying the membership rules that define them (Cattani et al. 2008; Hannan, Polos and Carroll 2007; Lounsbury and Rao 2004; Rosa et al. 1999). Evaluators take the collectively agreed upon characteristics for granted such that these classification schemes become the social facts or codes used to evaluate future candidate offerings. Ecologists contend that “the enthusiasts (and possibly other agents) try to abstract from extensional descriptions to some abstract code that makes sense of the class and can be used to decide not-yet-considered cases (Hannan, Polos, and Carroll 2007, p. 59).” For example, if a cell phone company claims that its phone is also a computer, the audience implicitly expects the cell phone to have certain features, perhaps a monitor, alphanumeric keys, and storage capabilities. When a new claim is made about categorical membership, the rules that define the existing category usually are not questioned; rather, it is assumed that the new claim must conform to implied characteristics of the category.

While the legitimatization process to create a new category is explicit, the application of the legitimate categories to evaluate other candidates is implicit (Johnson, Dowd and Ridgeway 2006). Moreover, the implicit follows from the explicit in the sense that what the market collectively agrees upon as the membership rules of a category is what is implicitly applied. In other words, organizational theory does not fully distinguish between the collective agreement to create a legitimate category and the application of that category to evaluate new instances. It assumes:

Assumption 2: A legitimatized category contains within it what counts as a correct application of it.

Collectively, these two assumptions underlie legitimacy’s influence over organizational behavior. Making explicit what does and does not belong in a category and then implicitly
applying this definition to new claims gives the category the power to include and exclude. If
the categorical boundaries are weak or market participants question the application of the
category, the legitimated category does not have enough power to condition behavior.
Consequently, this view of legitimacy emphasizes the generation of the rules that define our
cognitive categories and the implicit application of these rules.

**Testing these Assumptions - Method**

To test these assumptions, we analyze the history of how the insurance industry came to
understand and legitimate the new computer product category. This is a case of a new product
category as opposed to a new organizational form that is typical in organizational research. However, in
many cases new products, such as the computer, coincide with new organizational forms. And,
investigating product categories has the advantages of being more proximate and accessible than
organizational forms (Rosa et al. 1999) and is becoming more frequent object of analysis (see (Lounsbury
and Rao 2004)). Moreover, just as with organizational forms, pre-existing institutional schemas
play a significant role in how customers understand a radically new technology like the computer
(Hargadon and Douglas 2001). Lastly, we use the historical method because these assumptions
concern the process through which markets create and apply market categories, and historical
analysis is particularly adept at providing the narrative of how a process unfolds (Abbott 2004).

Our historical analysis focuses on how the insurance market represented the computer
within its own conceptual schema and actually used the computer. One concern is what in the
historical record accurately captures this conceptualization and use. Although not typical, these
types of epistemic analysis are becoming more common in historical research. For instance,
Bazerman (1999) focuses on the language and pictures used in discourse to examine how light
and power were represented and integrated within daily life. Following this approach, we focus
on the rhetoric and the conceptual devices the insurance market used to understand the computer
and how it can be used in the insurance market (originally gathered for use in a historical
monograph by one of the authors). The significant financial and organizational commitment it
took to purchase and implement a computer meant that customers needed to justify its purchase,
leaving a rich archival record of how the market initially categorized the computer. Research in
the archives of three insurance firms (Metropolitan Life, New England Mutual Life, and Aetna)
provides extensive data on some specific acquisition and use decisions in these firms. The
Edmund C. Berkeley papers at the Charles Babbage Institute (CBI) document Berkeley’s early
interactions with the computer industry on behalf of Prudential. The CBI also contains
transcripts of oral history interviews with early computer representatives, some of which shed
light on insurance users. In addition, one of the authors interviewed several individuals involved
in this transition in specific insurance or computing firms.

We also leverage the printed proceedings of annual meetings and special conferences of
three insurance associations, the Society of Actuaries, the Life Office Management Association
(LOMA), and the Insurance Accounting and Statistical Association (IASA)). These detailed
contemporaneous accounts describe many insurance firms’ thinking and decisions about what
computer to adopt and how to use it. For some firms, frequent conference papers document
ongoing use and results. Moreover, committee reports and special publications document
activities of insurance association committees investigating possible uses of computers in life
insurance. As a result, the insurance associations themselves are of interest in their significant
role of disseminating these different comparisons to individual insurance firms.
Because the insurance industry spent significant effort trying to understand the computer before it was actually released in 1954, we divide the history between this period and the actual use of the computer after its initial release.

**Before the release of the business computer: 1947 - 1954**

As an information-intensive business, life insurance had become early and important adopters of information processing technology. By the 1940s, virtually all insurance firms used tabulating equipment, most often rented from IBM but sometimes bought from Remington Rand. Indeed, IBM historians have noted that “Insurance companies were among the largest and most sophisticated business users of punched-card machines in the late 1940s and 1950s” (Bashe et al. 1986). Life insurance firms had generally divided and specialized insurance operations as they grew, and they used tabulating equipment in line with this approach. A typical insurance application performed a single, narrowly defined operation. By the late 1940s, however, some smaller firms had started to use tabulating technology to integrate information intensive processes such as premium billing and accounting operations in order to reduce data repetition (Cassara 1952).

These usage patterns and discussions identify a certain categorical schema that expresses how the insurance industry understood information technology prior to their introduction to the computer. This schema includes categories such as tabulating machines, clerical workers, information, and calculators as well as relations between these categories. For instance, the functional relation between clerical worker and tabulating machine was processing information; whereas, the relation between clerical worker and calculator was compute numerical results.
Figure 1 characterizes this conceptual schema which was eventually used to evaluate the computer.

As the clerical labor shortage during World War II was exacerbated by a post-war life insurance boom, insurance firms were seeking technology to automate more of their processes. From 1948 to 1953, the dollar value of life insurance in force grew 51% and the total number of insurance policies (a better indicator of information processing volume) rose by more than 24% (Bureau of Labor Statistics 1955). Growth in insurance employment was 12% during the same period, not enough to keep up with the increased data processing load. As a result, the insurance industry became increasingly interested in new technologies that address these economic issues. One promising technology was computing. Computing technology was used in the war for military purposes and in the post war period it was applied to computational work in businesses, in the case of the insurance industry actuarial work. In fact, during World War II a few insurance actuaries worked on the new computing technology being developed for military purposes (Moorhead 1989). After the war, computer manufacturers were working on developing computers oriented for managing business processes as opposed to just computational work – what became known as the business computer. It was this new kind of computer that the insurance industry that appealed to the insurance industry

In fact, before their commercial release in 1954, the insurance industry was heavily involved with computer manufacturers in designing early business computers. For example, Edmund Berkeley, an executive at Prudential Insurance, was directly involved with the
development of the UNIVAC – created by the Eckert-Mauchly Computer Company (EMCC, later acquired by Remington Rand) and the first computer available to commercial firms. In addition, most of the industry associations commissioned committees to study the computer and its potential uses for the insurance industry. Information about the computers primarily disseminated through these reports, paper presentations at association meetings, and other published manuscripts. In this article, we focus on two interpretations of the computer – Edmund Berkeley’s writings about the computer and the Society of Actuaries’ 1952 report on the potential uses of computers within the industry – because they are illustrative of the kind of analysis done at the time and they were influential in fitting the computer into the existing conceptual schema depicted in Figure 1.

*Edmund Berkeley and the “Giant Brain”*

Edmund Berkeley, a mathematician and actuary who worked in both Prudential’s actuarial and methods department, began exploring issues related to computing in the early 1940s. He emerged as a mediator between computer companies and insurance firms, often translating insurance industry’s perspectives and needs for computing vendors. He visited General Electric’s laboratories and Bell Labs as well as taking a more formal role with the EMCC. For instance, while consulting with EMCC, he insisted that the computer system include card-to-tape and tape-to-card readers and high speed printers to be compatible with existing practices within the insurance industry. Berkeley’s views of the computer were disseminated through his presentations to various insurance associations as well as his popular book on computers, *Giant Brains, or Machines That Think* (Berkeley 1949), published after he left Prudential in 1948.
Perhaps most revealing about Berkeley’s explanations of computers was his extensive use of analogies. Given his mathematical background and his exposure to the development of the computer, he could have discussed the computer in terms of its technical characteristics, but instead made three analogies: comparing the computer to calculators, human brains, and the tabulating machine. As early as 1947 he presented a paper to the Life Office Management Association (LOMA) meeting in which he described the new technology as “electronic sequence controlled calculating machinery …much like a desk calculating machine”, and he also referred to computers as a “Giant Brain” (Berkeley 1947a, p. 116). In the same year, Berkeley presented another paper at the IASA annual meeting (Berkeley 1947b) in which he suggested an analogy to a tabulating system by discussing potentially using it as a premium billing application, clearly derived from current tabulator applications. In his correspondence and negotiation with EMCC on behalf of his company, he further acted on this last understanding of the computer as a tabulator. He imagined that Prudential would use a computer system like it used its tabulating installation: for processing large numbers of transactions with a great deal of input and extensive output of transactional documents such as card records, and premium bills (Yates, 1997).

It was in his book *Giant Brains, or Machines That Think* that Berkeley developed his most extensive analogy with the human brain. In this book, Berkeley focuses on how computers (although he uses the more general term machine) can think just as human brains do, defining thinking as “a process of storing information and then referring to it, by a process of learning and remembering (Berkeley 1949, p. 2)”’. He categorizes this process along three main functions: “Calculating: adding, subtracting, …; Reasoning: comparing, selecting, …; Referring: looking up information in lists, … (Berkeley 1949, p. 181). Armed with this basic definition of thinking, he explained that computers use languages and physical equipment to handle, transfer,
remember, and reason with information just as the human brain uses natural language and nerve cells. To give further plausibility to the analogy, he listed types of thinking a computer would not be good at – “2. Do intuitive thinking. 2. Make bright guesses, and leap to conclusions. 3. Determine all its own instructions. 4. Perceive complex situations outside itself and interpret them (Berkeley 1949, p. 8). ”

To further develop the analogy, he also evaluated the effectiveness of various human and machine based systems to handle and process information based on the criteria of costs, space to hold the information, ability to keep and erase the information, and versatility. His intent was not to show that one is better than the other but to appreciate the advantages of different kinds of thinking machines. In the rest of the book, Berkeley extensively surveyed how existing machines think according to this definition of handling, retrieving and processing information along these dimensions of merit. This survey included the main machines as of 1946: punch card calculating machines, MIT’s differential analyzer, Harvard’s IBM Automated Sequence-Controlled Calculator, ENIAC, and Bell Laboratories’ General Purpose Relay Calculator. This analysis establishes that existing machines already perform some of these thinking functions, especially calculating, but leaves open for future machines to further develop reasoning and referring functions.

As a result, through the use of analogies, Berkeley fit the computer into the pre-existing categorical schema (figure 1) at the relational level. He interpreted the computer through how it relates to and is functionally similar to available categories, such as the human decision maker, tabulating machines, and calculators. In the process he clarified existing relationships between categories, for instance, tabulating machines calculate and refer, but they do not effectively reason. Figure 2 shows the revised schema as proposed by Berkeley’s analogies.
During this same time period, several insurance associations convened special committees to investigate and explain the new technology. The “Committee on New Recording Means and Computing Devices,” established in 1947 by the Society of Actuaries, was the committee with the greatest influence. As its influential 1952 report would explain, “life insurance people and electronic engineers were two groups who did not speak each other's language. [...] It became apparent that some medium was necessary to bridge the gap between the two” (Davis et al. 1952, p. 4). The Society of Actuaries formed its Committee—composed of actuaries from the 1st (Metropolitan Life), 4th (Equitable Life Assurance), and 14th (Connecticut Mutual Life Insurance) largest insurance firms (Best 1948)—to bridge this gap for the industry, rather than leaving it to each company to bridge the gap individually (Yates 2005). Its mandate was to study how insurance firms might beneficially use the emerging electronic computing equipment.

Where Berkeley characterized the computer through analogies, this report described the computer primarily in terms of the functions it could perform. Rather than focus on the technical characteristics of the computer, the committee felt it important to “find out just what such equipment can do for us, how reliable it is, and whether it would help us to further improve the economy with which we serve our policyholders (Davis et al. 1952, p.5).” As a result, very little time in the report is given to explaining what a computer is. In the 107 page document, only 10 pages are devoted to explaining how the computer works and much of this discussion is situated
in comparison with how tabulators perform the same function. For example, the section to define programming begins:

On punched card machinery when we do a job for the first time, we arrange the wiring of the machine by setting up proper contacts through a removable plug board. The board is a separate panel which can be used to do the job, then taken out of the machine and kept, to be used again later. The same idea is applied with magnetic tape equipment. Here, instead of wiring a plug board, a procedure known as programming is applied (Davis et al. 1952, p. 14).

Instead, much of the report focuses on what the appropriate applications of computer are and then walking through several test runs of these applications on an existing computer to demonstrate that it can be done. In identifying potential uses, the report argues that computers should not be thought of purely as “computing machines” but as “information processing machines” capable of many different tasks (Davis et al. 1952, p.5). They considered five broad functional areas: actuarial investigations, policy settlement work, file keeping, and regular policy service. Similar to Berkeley, they evaluated these functions based upon reliability and cost. For example, they rejected policy settlement work on these grounds:

However, the more we analyzed policy settlements as a separate field of work, the more apparent it became that the volume of work involved was relatively small and the wide variety of operations which are necessary seemed to require computer capacity that was quite large. Accordingly, we concluded that policy settlement work, taken by itself, did not represent an area where very much economy could be achieved by introducing electronic computers (Davis et al. 1952, p. 16).

The Committee rejected actuarial work on similar grounds and decided against file keeping because of concerns over whether using magnetic tape to file information would satisfy regulatory requirements for a visual record of policy holder information. They ultimately decided to focus on policy service or “the work which is necessary to tell the policyholder about
his premium due and, on participating business, to develop the annual dividend payable, the additional insurance that dividend would purchase if it is to be so applied, the interest which would be due on a policy loan if any exists and the like (Davis et al. 1952, p. 16).

The rest of the report was a detailed analysis of applying an existing computer to perform these functions, down to the data requirements, calculations, and functions. They concluded that a firm probably could just as well with a smaller punched card machine computer because they “still found that it was desirable to do certain operations outside the computer system … Couldn’t we, with a little bit more manual attendance and with a little less automotive machinery, accomplish essentially the same result with a smaller computer (Davis et al. 1952, p. 23)?” Based on this insight, they argued that the computer would be more feasible if they expanded the number of activities that computer performed to include, for instance, work done in the Actuarial Division. They called this the Consolidated Functions approach.

It is important to recognize that the so-called Consolidated Functions approach, presented in the 1952 report, was based on the integrated premium billing and accounting application for which some firms used tabulating technology by the early 1950s. For smaller and more innovative insurance firms already using the tabulator application, it represented an incremental extension that integrated a few more operations, rather than a radical transformation. For those firms still using traditional subdivided operations, however, this application represented a somewhat more radical change in insurance processes. The Committee demonstrated the application’s workability using IBM’s Card-Programmed Calculator (CPC), a transitional system that was not a real stored-program computer like a UNIVAC, and used punched cards instead of magnetic tape, underscoring the more incremental aspect of the application. The Committee’s vision of computer use as embodied in its Consolidated Functions approach, which had both
incremental and radical aspects, would influence insurance use for the next two decades—indeed, it would take that long for most firms to achieve the application. The report’s final summary, however, stressed an incremental, rather than radical, approach to this change—at least in the immediate future:

Realization of their full potential will lead us to the consolidation of many different kinds of work which now are departmentally separated. This, however, is not necessarily a matter of sudden, drastic reorganization. The program indicated is more likely to be the introduction of an electronic computer for one related series of procedures, and the gradual step-by-step adaptation of other routines as we learn at first hand the machine’s capabilities and limitations. (Davis et al. 1952, p. 49)

Although different the Berkeley’s analogies, this analysis of the computer fits within his schema, focusing primarily on the relation between tabulating machines and computers in terms of the tasks they can perform. It emphasized the broader functional capability of the computer and provided concrete examples. Collectively, these communications created an interpretation of the computer prior to its commercial release in 1954 that fit into the existing categorical schema as depicted in Figure 2. This understanding did not focus on the computer’s technical characteristics, but on its relational similarities with pre-existing technologies and the people who make business decisions, in particular the functional relationships. Cost, along with other information processing features such as storage and retrieval, became the dominant criteria to evaluate the effectiveness of the computer.

The commercial release and early use of the computer: 1954 – 1960s

As the first computer became commercially available to the insurance industry in 1954, insurance firms had to translate their interpretations of computers into rentals or purchases of
equipment and into insurance applications. Both of the tabulating incumbents, IBM and Remington Rand, offered computers that were radically different from tabulators as well as devices that were only incrementally different. Remington Rand, through its acquisition of EMCC and its UNIVAC, had taken an early lead in computer technology. The UNIVAC computer system filled a room, with its large central processor, many Uniservo tape drives, and tape-to-card and card-to-tape converters. The room had to be specially prepared, with reinforced floors to support the computer’s weight and a powerful air conditioning system to reduce heat emitted from the many electronic tubes. When Metropolitan Life installed its UNIVAC, the components of the computer were so large that the company had to use a crane to raise them up the outside of its building and swing them in through a window. This computer looked radically different from tabulators, and the glassed-in room Metropolitan Life created for it drew internal and external gawkers. Moreover, its selling price was around $1.25 million, a substantial capital investment. IBM was working to catch up with the UNIVAC technically, developing the large, tape-based 701 (available in 1953) for scientific and defense use and the 702 (available in 1955, but replaced by the more reliable 705 in 1956) for commercial use. Like the UNIVAC, IBM’s 700-series computers included converters to allow users to use cards or tape as an input/output and storage medium.

Both computer firms also developed devices with designs that shared fundamental features of both tabulating and computer technology. IBM intended its 650 model, announced in 1954 and released in 1955, as an interim, small computer to keep its installed base of tabulator users from moving to other computer vendors as it completed its development of bigger, magnetic-tape-based computers (Ceruzzi 1998). The 650 shared some essential features of the larger, 700 series computers, such as stored program capability (though during operation the
program was stored in a magnetic drum rather than on magnetic tape), and some of tabulating machines, such as using cards rather than magnetic tape as its primary long-term storage medium. Table 1, adapted from a 1954 IBM presentation at an insurance association meeting, arrays the 700-series computers and the 600-series tabulating equipment on a continuum, placing the 650 in between but slightly closer to the computers than the tabulators. The IBM 650 closely resembled tabulating machines visually, as well. It was housed in a cabinet of the same design and appearance as that of an IBM 604 electronic tabulator (a tabulator using vacuum tubes, introduced in 1948), and it could be rolled into an existing tabulator installation to fit where the 604 had been (Yates 2005). To insurance firms, it clearly presented a stark contrast with the enormous and alien-looking UNIVAC and IBM’s 700-series computers. The 650 offered an incremental advance on the familiar tabulators, allowing adopters to keep their current tabulating installation room layout, cards, rental model, and normal vendor.

Remington Rand also recognized the need for an incremental hardware solution for customers not yet ready for the large UNIVAC, and it released two smaller, punched-card machines (the UNIVAC 60 and 120) in the early to mid 1950s. Despite the UNIVAC name, however, these machines were developed internally based on Remington Rand’s 409 tabulator and lacked any internal storage capability; thus they were far closer to tabulators than to computers. Although these machines were reasonably successful in the tabulator market, they did not really compete with the IBM 650. Moreover, Remington Rand had difficulties absorbing EMCC and another
small computer start-up and devoted inadequate resources to entering the computer market. The resulting delays in the availability and lapses in the marketing of these machines allowed IBM to pull ahead in the market (Norberg 2005). Both incumbent firms attempted to offer an incremental solution that closely resembled tabulating machines in design, dimension, and cost but that allowed users to move towards computer technology, as well as a more radical solution, the large, tape-based computer. IBM was far more successful in filling this user-perceived need.

Several other early entrants into the computer market offered small and inexpensive drum-based computers during the early and mid-1950s, but they were slow, harder to program, less reliable, and often required IBM punched-card peripherals for customers desiring card input and output (thus diverting much of the revenue to IBM) (Ceruzzi 1998). Moreover, the companies producing them (e.g., Consolidated Engineering and Computer Research Corporation) lacked both knowledge about pre-existing uses of tabulating machines and an installed base of customers. They generally were bought up by larger firms attempting to acquire the capability to produce computers. Since these larger firms were not in the tabulator market and had not worked closely with insurance firms, they also lacked knowledge of pre-existing insurance uses of tabulating technology, awareness of their interpretations of computers, and established sales and service relationships with insurance firms. Unsurprisingly, they achieved very little presence in the insurance user market.

*Early Insurance Use of Computers*

Consistent with the pre-release understanding, insurance firms overwhelmingly followed an incremental path, with most initially acquiring the more tabulator-like 650 after it became available in 1955 and transferring existing tabulator applications onto it. Although the UNIVAC
was available a year earlier, in 1954 and 1955 only four insurance firms—Metropolitan Life, Franklin Life Insurance Company, John Hancock Mutual Life, and Pacific Mutual Life Insurance—took delivery of UNIVACs. In 1956, a panel on the new computing technology at the annual IASA conference included 18 papers on IBM 650 applications and only 3 on UNIVAC applications (IASA 1956). By the following year, life insurance companies had acquired roughly 50 IBM 650s (Carlson 1957). The Controllership Foundation surveyed various industries’ uses of computers, including insurance, from 1954 – 1957, showing that the IBM 650 was used 62% of the time (1958).

Beyond deciding which type of equipment to use, insurance firms had to determine which applications to develop. In fact, how insurance firms used the computer varied significantly. For example, consider the differences between the four insurance firms who bought the UNIVAC. The two large UNIVAC adopters, Metropolitan Life and John Hancock initially converted existing tabulator applications with no additional integration; whereas, the two smaller firms, Franklin Life Insurance Company and Pacific Mutual Life Insurance chose to transform their business practices. A major factor was cost – a key performance criteria identified by both Berkeley and the 1952 report. Projected cost savings influenced which applications insurance firms developed. On paper, at least, a single function could provide adequate volume for payback in very largest firms, but in most firms one function was not enough, and multiple consolidated functions were needed to justify purchase (Swinerton 1956).

Beyond the concerns for cost, existing methods and practices shaped the initial use of the computer. Metropolitan Life and John Hancock, both of which had struggled with serious clerical labor shortages for a decade, were large enough that each simply converted a single tabulator application onto the UNIVAC, the most incremental of use strategies. Although two of
its actuaries were on the Committee that developed the Consolidated Functions plan, Metropolitan’s top executives hesitated to start with such a use, given the company’s investment in the existing record system, the organizational disruption that would be required to integrate previously unintegrated operations, and the potential threat to customer relations around the premium billing application. Consequently, “the company, … although inclined to accept the idea that some sort of consolidated operation was indicated as a long-range objective, still felt that a system should be applied to a localized area as a means of getting started” (Davis 1953, p. 15). Its executives viewed the actuarial application as less risky than the Consolidated Functions application, and they calculated that this application would allow them to pay back the computer investment in just four years. In addition, Metropolitan Life was very concerned that clerical workers would negatively react to a new technology that could potentially replicate what they did. It developed a campaign to show employees that UNIVACs would not eliminate demand for jobs, including posting a sign in the main lobby at the display of the UNIVACS that spelled out UNIVAC to mean Uncharted Need Is for Volume Additional Clerks. John Hancock, the fifth largest insurance firm, had already integrated its premium billing and accounting applications on tabulating equipment, and it justified its purchase by transferring this application directly to the UNIVAC. The integration in this application involved only two functions rather than the expanded set recommended in the Consolidated Functions plan.

In contrast, the two medium-sized firms adopting a UNIVAC, Franklin Life and Pacific Mutual, chose to transform their processes by integrating multiple functions as they computerized. When they chose the UNIVAC and the application based on which they would justify it, neither was large enough to simply transfer an existing function from tabulators to the UNIVAC, and both faced unusual circumstances that motivated their desire to acquire the first
computer expected to be commercially available. Franklin Life’s sales were growing at five
times the industry rate, and the office force needed to service its policies was also growing at a
rapid rate. By 1951 it faced a space crisis that would soon require building a new headquarters
office building (Becker 1954; Vanselow 1954). One executive argued that adopting a UNIVAC
would slow the clerical growth enough to postpone need for a new building for several years. To
show that a UNIVAC would pay off for the firm in four years, he proposed a plan to consolidate
operations even beyond what the Society of Actuaries Committee would recommend in the
following year. Its use was clearly more radical and innovative than those of the two large firms.

Pacific Mutual took an even more radical approach to computer use. Because of a
financial crisis, the California State Insurance Commissioner had reorganized it starting in 1936.
When the firm decided to order its UNIVAC in the early 1950s, it had recovered from the worse
of the crisis, was growing fairly rapidly, and wanted to cut its still high costs by adopting the new
technology. It also devised an integrated application, abandoning its cards for magnetic tape. It
ran a daily cycle system that processed every policy every day, updating information as
necessary and printing all records out on a high-speed printer. This use required an immediate
and radical transformation of the company’s processes. As one of its executives explained,

It is not merely a means of doing with electronic data processing devices
the same work that was formerly done on electric and electronic
accounting [i.e., tabulating] machines. It is a sweeping new approach to
the problem. Its economies come not so much from a faster, higher
powered machine as from the single file concept processed daily to meet
the relatively random reference needs of service to our policyowners.
(Dotts 1956, p. 23).

More broadly, the Controllership Foundation survey revealed a wide variety of
applications. 85 distinct applications were identified across 63 implementations. Over half of
the applications were implemented only at one location. Table 2 presents the most commonly developed applications (1958). Consistent with the proposed policy information uses of the computer outlined in the 1952 report, managing parts of the premium billing processes were some of the most prevalent uses of the computer. However, also consistent with the UNIVAC examples, the survey also shows that firms varied in what parts of the premium billing process they automated. Within the survey, premium billing was broken into three distinct applications: billing, distribution, and collections. 48 of the establishments implemented at least one of these functions, with 52% of these sites implementing all three. In some cases, such as State Farm, it appears to be company policy that all premium billing functions were automated as all individual establishments had the same profile; whereas, others companies varied across establishment.

Deploying the computer also provided an opportunity for insurance firms to learn more about it. For example, Prudential purchased both an IBM 650 and 700 series computer and attempted to transform its insurance processes immediately and radically by converting its ordinary insurance records to tape and creating a unified application with premium billing, accounting, and commission calculations, complete with annual statements. James Daley, manager of the Electronic Service Division, explained in 1957:

The Prudential chose to take full advantage of the abilities of this new equipment and did not pursue the course of minimum systems changes – using the 702 or 705 as a type of ‘electronic tabulator’ where the conventional plugboard is the computer program. Our basic approach has been to take full advantage of the essential operating characteristics of the equipment. (Daley 1957, p. 366)
Although Daley and Prudential clearly saw distinctions between the computer and previous technologies, they underestimated the effort to get the new system operational. One issue was conversion of data. Given Prudential’s size (second largest insurance firm), a test conversion of 6 districts required converting more than 13 million punch card to took four weeks to complete. Daley also noted that Prudential had difficulties in choosing programmers. Rather than follow other firms and use a test to identify capable programmers or rely upon outside consultants who did not understand the industry, Daley incurred the extra cost of selecting programmers based upon their performance in a programming school. Lastly, Daley recognized the issue of adequately training the users of the systems as another source of additional effort that is “obscured many times in electronics installations by the expectation of personnel displacement (Daley 1957, p. 366).” This underestimation, in turn, impacted the costs for handling this new equipment, which rose during this time period.

As a result, in some sense the initial implementations of the computer reflected the pre-release conceptualization of the computer as insurance firms favored the tabulating-like 650 and primarily converted existing tabulating processes. Concerns about costs and employee satisfaction as well as existing methods and practices shaped this deployment decisions. However, there was also significant variation as several firms, such as Prudential and Pacific Mutual, experimented with developing new processes that took greater advantage of the computer's expanded capability. As Howard Ditman, New York Life’s vice president, argued: “to treat such a radical innovation as merely an adjunct to the traditional division of administrative responsibilities, to consider it merely as a glorified punch card or addressograph system, is to underestimate grossly what may be accomplished (Ditman 1955, p. 191). Yet, this variation was not out of the realm of possibility in the sense that it maintained the comparison
between the computer and tabulating machines while emphasizing their differences. Moreover, the actual use of the computer helped insurance firms better understand these differences. In Prudential’s case, they learned that the 1952 Report’s comparison of programming a computer with plugboarding was an oversimplification as programming required different skills and was more onerous than plug boarding a tabulating machine. Consequently, the actual use of the computer played a significant role in further developing the insurance industry’s conceptualization of the computer.

**Analysis of Assumptions**

With the basic facts of the history of the insurance industry’s categorization of the computer outlined, we can now begin to assess whether they support the current assumptions about legitimization and the application of legitimated categories.

The first assumption speaks to the necessary requirements for legitimation, in particular the requirement for collectively agreeing upon the essential characteristics that define the category’s boundary. In the insurance case, these requirements imply that the insurance industry should go through a social process that culminates with its collectively agreement about the defining characteristics of the computer. However, our analysis reveals that the insurance industry did not focus on identifying essential characteristics that define a computer, but instead interpreted the computer by relating it to the existing categorical structure through a series of analogies and focusing on its potential applications. In fact, these descriptions of computers purposefully did not discuss at length the technical and essential characteristics of the computer.
in fear of losing the more business-oriented audience. Rather, the fitting in of the computer occurred at the categorical system level, in particular its relational structure.

Prior to the introduction of the computer, the insurance industry recognized certain relations, often functional, between categories (see Figure 1). Berkeley’s use of analogies and the 1952 report’s focus on potential uses of the computer related it to existing categories in similar ways the existing categories already related to each other (see Figure 2). Humans use computers and they convert and process data like tabulating machines. As a result, the legitimation process prior to the release of the computer culminated with the insurance industry not really agreeing on what the computer was in an essential sense, but having an understanding of how it might fit within its existing categorical scheme.

However, consistent with the first assumption, these analogies were socially constructed. Conceptually, the computer could have been compared to any number of possible target categories and relations. And, comparing the computer with other market objects required knowing something about the computer, but not every market participant had such knowledge. Consequently, those actors who are in the privileged knowledge position, what Levi Martin (2002) calls “cognitive authorities”, can heavily influence what comparisons cognitive novices actually make. In this case, Berkeley was in the unique position of being an insurance insider while also gaining access to the computer manufacturers, enabling him to construct these analogies. Moreover, the professional associations created cognitive authorities by commissioning reports on the computer which were then communicated to other insurance firms through the association. As a result, significant power affords the social actors who establish these relationships. However, unlike the first assumption this authority does not necessarily persist as the categorization is still open for interpretation. For example, Berkeley’s analogy
between the computer and the brain identified several relations – calculating, reasoning, and referring – but in practice many insurance firms initially focused on the calculating and referring functions by converting processes already automated by tabulating machines.

The second assumption speaks to the taken for granted application of a legitimated category. In this case, it implies that the insurance industry should apply the computer category as it was conceived in its legitimation process. Indeed our analysis shows that in general insurance firms adopted an incremental approach outlined in the 1952 report, but they also varied significantly in how they applied the computer. This variation, in turn, did not seem correlated with other characteristics such as firm size or type of computer deployed. That is, some large firms like Metropolitan favored implementing a single application; whereas, others like Prudential tried to transform their business processes. Even firms using the same kinds of computers varied in how they deployed them, as demonstrated with the four initial users of the UNIVAC. Closer consideration of the variety reveals that none of the particular instances represented a new comparison not already considered in the pre-release conceptualization. One possible explanation of this variation is the differences in the goals of the firms using the computer. Cognitive scientist who study analogies identify the pragmatic goals of the actor using the analogy make certain elements and relations more relevant (Holyoak and Thagard 1989). Those insurance firms who were looking to make dramatic business process changes, such as Prudential and Pacific Mutual, focused on different aspects of the comparison than those looking for incremental improvement. In particular, the different uses varied in whether they focused on differences with the tabulating machine or similarities with the tabulating machine. Therefore, in one sense, the application of the computer was consistent with how the computer
fit in the conceptual scheme, but the assumption does not predict the variation in how it was actually used.

Moreover, the variation in the application of the computer category enabled the insurance industry to learn more about the computer and validate its conceptualization. In fact, using the computer raised concerns about its cost effectiveness – one of the key metrics found in both Berkeley’s analogy and the 1952 report. Computers, even the smaller tabulating-like ones, were significantly more expensive than tabulating machines and the insurance industry, as highlighted by Prudential’s experiences, underestimated implementation costs. Yet, the computer persevered because insurance firms were committed to the computer given its high sunk costs and the pre-selling of the computer as a technology of the future (re-call the displays of computer equipment in Metropolitan’s lobbies), as well as none of the uses violated the computer’s place within the categorical schema. Consequently, the conceptualization of the computer does not fully determine its application. The actual use of the computer, both anticipated and actual, plays an important role in shaping the process of comparison. Understanding the computer was not simply explicitly defining what it is and then implicitly applying that definition; rather, the actual application of the category further informed its categorization.

**Discussion: A new perspective on legitimacy**

Our historical analysis of the categorization of the computer by the insurance industry suggests that we should relax these basic assumptions about legitimacy. This raises several issues for a more comprehensive explanation of legitimacy. First, in abandoning these assumptions, we must still be able to explain how legitimacy conditions market behavior. Collectively these assumptions express the normative power of legitimacy in terms of categorical
membership violations and the audience’s implicit application of categories. Without these assumptions, we must be able to provide an alternative account of how a legitimated category conditions market behavior. Second, our account of legitimacy must be general enough to account for the different legitimation processes observed – the classification perspective that prevails in the literature and the more comparative approach discussed in the computer case.

In this section, we develop an alternative definition of legitimacy that meets these basic requirements. We define legitimacy as:

*Legitimacy:* A legitimate category entails (1) coherence within a category schema, and (2) persistence when applied to consider new alternatives.

Rather than defining legitimacy in terms of categorical membership, we define it more broadly in terms of being consistent with the broader categorical schema. Thinking of legitimacy as coherence allows for legitimating new categories to occur both through classifying a new category as well as aligning a category within the relationship structure of a categorical schema. In addition, legitimacy’s normative power does not come from categorical membership determined by collective agreement but from the audience’s application of the entire schema, categories and their relations, to evaluate candidate’s offerings. Moreover, we abandon the belief that legitimatized rules are implicitly applied. Instead, a category may lose its coherent standing within a categorical schema through the audience’s very application of the schema to interpret a new instance or through the application of that category. To the extent that the category persists in the face of these challenges, it maintains it legitimacy. As a result, we disentangle legitimation and the application of categories but do not privilege one as more primal than the other. The application of the categorical schema can change a particular category’s coherent position just as the legitimation of a category can influence its application.
To develop this account, we begin by further differentiating the two approaches to legitimization and show how coherence is a common ground between them. We then develop the notion of persistence as a means to measure a legitimated category. Throughout this discussion, we identify potential ramifications for organizational research.

In general, legitimacy is conceptualized as adhering to socially held beliefs and norms (Weber 1978). In the case of categories, our analysis reveals two different kinds of integration: fitting in the category schema in the sense of creating a well-defined category (classification) versus aligning a label with the relational structure of the categorical schema (comparative). Theoretically, these differences are not trivial because they lead to different predictions about what a firm should do strategically in order to be legitimated. The classification view focuses on defining a category’s boundaries and distinguishing it from other categories. Shared attributes of proximate categories can help legitimate a new category, but if the overlap consists of attributes that are too significant to the new category it risks being assimilated into a pre-existing category (Dobrev, Ozdemir and Teo 2006; Ruef 2000). Consequently, from the candidate’s strategic perspective, firms want to present a focused identity to facilitate the classification process while also making distinctions from existing categories (McKendrick et al. 2003). This strategy relies upon making the differences between categories more salient.

In contrast, the comparison view recognizes that market actors not only compare attributes within a category but also align the new category within the existing category relational structure. In this view, the relations between the various categories are an important factor to the understanding and assimilation of a new category. As a result, the comparison approach suggests that legitimation of a new category is not a matter of having more differences at the category level, but is a function of fitting within this relational structure, typically through
the use of comparisons and analogies. Cognitive scientists point out that an interesting feature of analogies is that establishing similarities in the relational sense facilitates recognizing differences at the category level (Gentner and Markman 1998). In this case, Berkeley’s extensive analogical work to show the functional similarities between human brains, tabulating machines, and computers made it easier to identify the key difference between computers and tabulating machines – reasoning. Therefore, contrary to the classification approach, the comparative view somewhat paradoxically implies that the more relationally similar a new instance is, the easier it is to differentiate it from other categories. From a candidate’s strategic perspective, firms want to emphasize relational similarities in order to increase recognition by the audience (Bielby and Bielby 1994). One way is through robust design – incorporating design elements that invoke institutional memory. For instance, computer manufacturers made some machines like the IBM 650 look like tabulating machines.

Despite these significant differences between these views, they share a common ground in the belief that the audience must integrate the category within an existing categorical schema. These different approaches concentrate on different characteristics of a categorical schema – the composition of the underlying categories (classification) and the relations between the categories (comparison). Coherence is a more general way to think about adherence with the categorical systems that embraces both of these aspects. More specifically, coherence means that the category is compatible with the existing categorical system with respect to its demarcation from other categories and its underlying relational structure. Therefore, we can think of coherence as a continuum: at one end is incoherency to the extent that a new instance is not well demarcated and does not fit within the relational structure and on the other is coherency to the extent that a new instance creates a unique category that inter-relates with other categories according to the
relational structure within the schema. In between there are variations of coherency depending upon the levels of demarcation and relations between categories.

This structural interpretation of coherency has the advantage of providing a more nuanced account of the different ways a new category could be legitimated. Legitimation is not binary, as frequently treated in the organizational literature, but comes in different forms. For instance, a category could be legitimated in terms of having well defined membership criteria but being less integrated with the relational structure of the categorical schema, or as in the case of the computer, being well aligned with the categorical schema without having clear membership criteria. Further research can explore how the structure of the categorical system itself with respect to the demarcation of the categories and their relations, influences how a new instance coheres (see (Kahl 2008)). In addition, scholars could leverage these different kinds of legitimacy to help explain potential performance differences across legitimated categories. Cohering a certain way as opposed to another may lead to better performance.

With coherency as the underlying principle of legitimacy, the source of its normative power shifts from membership within a particular category to the audience’s application of the whole web of the classification scheme. Legitimacy’s behavioral constraints are embedded within the social exchange between the candidate making the offering and the audience invoking the categorical system to evaluate this offering instead of a preconceived notion that offering must fit within a particular category. Therefore, in order to be evaluated, a candidate must regulate her offering such that it coheres with the existing audience’s schema. This regulation, in turn, constrains the strategic choices of the firm while also giving the firm more freedom around how it presents its offerings.
We have also relaxed assumptions about the audience’s application of categories which implies that pre-existing categorical system could itself change as it is applied to evaluate new cases. When faced with an instance that does not neatly fit the existing schema, the schema may change to accommodate the new instance as opposed to the new instance modifying to fit within the schema. In fact, the computer case demonstrated a change in the insurance industry’s categorical structure. Prior to the introduction of the computer, there existed implicit relations between the human operators of tabulating machines and the equipment itself that reflected beliefs about how insurance firms should use technology (see Figure 1). Clerks used tabulators to help automate tasks that previously were done by people, developing a general idea that tabulating machines were analogous to humans in the sense that they process information. Berkeley’s comparison of the computer with the human brain made explicit different aspects of these relations. Humans do not just use a computer, but they use it in specific ways – to make calculations, to reason through decisions, and to refer to previous information. He also recognized that machines may focus on different characteristics of thinking. In fact, he lumped tabulating machines into a group of mechanical brains that “are fond of numbers; their main work is with numbers; and the other kinds of thinking they do are secondary (Berkeley 1949, p. 144).” Berkeley’s detailed analogy with the human brain clarified the generally perceived relationship between tabulating machines and humans to simply mean calculating and referring (see the change in Figure 2). As a result, the introduction of the computer influenced the pre-existing categorical structure just as this structure influenced its interpretation.

Consequently, after the legitimation process establishes a category’s initial coherency within the schema, the category may become more or less coherent over time as the schema is used to make such interpretations. Changes in a category’s level of coherence with the
categorical schema express its level of legitimation. To the extent that a category persists as a consistent member within the schema as it is applied to consider new cases, the category remains legitimate. Just as there are different kinds of legitimacy, there are different kinds of de-legitimation. A category could cohere less with the system by becoming less internally consistent or as in the case of tabulating machines by weakening its relations with other categories. In addition, there may different sources of these changes. One is the institutional entrepreneur who actively changes the underlying categorical structure, but another is the more in-direct by-product of the audience using the categorical system to interpret new instances. Yet, another, as we saw in this case, is what is learned by actually using the category.

Yet, changing the level consistency of an existing category is no trivial matter. Changing one category may require changing other categories to which it is related or as in this case the relational structure between categories. The introduction of the computer entailed the re-examination of the tabulating machine’s relationship with human operators. Further research can explore how the structure of the categorical system itself with respect to the demarcation of the categories and their relations, influences the propensity of the coherency level to change. Are legitimate categories more likely to decay because of the categorical structure to which it coheres? For example, Martin (2002) characterizes tightly held belief systems as a framework which is highly inter-connected. In these cases, when faced with a new instance, it seems more likely that the existing category will persist because changing one element in the existing systems requires making many other changes with related elements. Such situations may require an institutional entrepreneur to identify a new relational scheme connecting the categories.

As way of summary, this approach broadens the scope of strategic activity for organizational firms than typically allowed for in organizational theory. Under the current
assumptions about legitimacy, the candidate’s strategic action is constrained to presenting itself in way to that promotes classification or the harder task of changing the rules themselves (Fligstein 1997). The new coherence and persistence conceptualization of legitimacy implies that firms can also influence the cognitive process through which the audience interprets the offering. For example, firms can help shape how the audience coheres its offering: robust design invokes comparison at the attribute level increasing recognition (Hargadon and Douglas 2001); whereas, analogies help establish relational and functional similarities. Moreover, different strategies may be preferred depending upon the structure of the categorical system.

Equally important is the need for firms to maintain their legitimate status. Under the current view, the taken for grantedness aspect of legitimacy suggests that legitimated firms need only worry about potential underlying classificatory changes. In fact, in the ecological literature, these social codes lead firms to be inert in the sense that they avoid violating these codes (Hannan and Freeman 1977). However, with this view, a legitimated category is susceptible to become less coherent without direct challenges to how it is classified. A change somewhere else in the system may indirectly challenge its coherency within the system. As a result, legitimacy incurs a maintenance cost not previously recognized in the organizational literature, and firms may have to respond to what at first glance appears to be unrelated categorical changes. Finally, the computer case expanded the scope of strategic action to include other market participants that mediate the economic exchange between candidate and audience. Cognitive authorities who help shape the classification structure need not be directly involved in the exchange, but could be industry associations as in this case, trade associations, or the media (Rosa et al. 1999). Each of these participants have their own strategic objectives as it relates to the categorical schemas used
to interpret market activity, suggesting the need to develop a broader community-level view of competition.

**Conclusion**

In this article, we have challenged basic assumptions about how categories get legitimated and how market participants apply legitimated categories. In so doing, we encourage organizational theory to move from conceptualizing legitimacy purely in terms of categorical classification and taken for grantedness to thinking of legitimacy as part of an epistemic practice embedded within market activities. One way we have done this is to expand our understanding of the various cognitive devices and aspects of the categorical schema market participants use to interpret market activity. Categories are not simply used to classify, but they are also used in a wider array of epistemic activity, for instance, induction through the use of analogies. Relations between categories matter as well as the actual composition of any particular category.

Also underlying this discussion is the explicit recognition that within markets an audience’s evaluation of a candidate’s offerings involves providing reasons for that evaluation. Participants use categories to make claims about market activity and as such their use requires justification. This justification may be implicit or may require more explicit reasons for this belief. Our critique has shown that creation of the legitimated category is quite another thing than what counts as good reasons to apply the category in that way. Legitimation is different than legitimately applying a category. One way to interpret our characterization of legitimacy is to think of coherence and persistence within a categorical schema as part of a justificatory process. If the offering does not cohere with the system, it is not a warranted application and there is no reason to accept its use. Therefore, if organizational theory continues down this path
of explaining market behavior as a function of the market participants’ conceptions, beliefs, and norms, it must continue to develop these epistemological aspects – the different ways markets generate knowledge and the justificatory routines used to warrant these claims.
References

Bazerman, C. 1999. The Languages of Edison’s Light: Mit Pr.
—. 1949. Giant Brains; or, Machines that Think. New York: John Wiley and Sons.
Daley, James. 1957. "Conversion to and Installation of IBM 705 Systems at the Prudential."


Figures

Figure 1: The insurance industry’s categorical schema before the computer
Figure 2: The insurance industry’s categorical schema after the computer
Table 1: Comparative Features of IBM’s Electronic Data-Processing Machines

<table>
<thead>
<tr>
<th></th>
<th>604</th>
<th>607</th>
<th>CPC</th>
<th>650</th>
<th>701</th>
<th>702</th>
</tr>
</thead>
<tbody>
<tr>
<td>Announcement Date</td>
<td>1948</td>
<td>1953</td>
<td>1949</td>
<td>1953</td>
<td>1953</td>
<td>1953</td>
</tr>
<tr>
<td>Storage (# of decimal Digits)</td>
<td>50</td>
<td>66 - 162</td>
<td>290 - 930</td>
<td>10,000 – 20,000</td>
<td>20,000 – 8,000,000</td>
<td>2,000,000 – 575,000,000</td>
</tr>
<tr>
<td>Card input/Output</td>
<td>100/100</td>
<td>100/50</td>
<td>100-150/30</td>
<td>200/100</td>
<td>150/100</td>
<td>250/100</td>
</tr>
<tr>
<td>Magnetic Tape</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Page Printer</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Program Control</td>
<td>Wired</td>
<td>Wired</td>
<td>Wired/Stored</td>
<td>Stored</td>
<td>Stored</td>
<td>Stored</td>
</tr>
<tr>
<td>Monthly Rental</td>
<td>$550 Up</td>
<td>$800 Up</td>
<td>$1,175 Up</td>
<td>$3,250 – 3,750</td>
<td>$11,900 – 15,000</td>
<td>$20,000 Up</td>
</tr>
</tbody>
</table>

Table 2: Number of establishments that implemented the applications

<table>
<thead>
<tr>
<th>Application</th>
<th>Instances (n=63)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium Distribution</td>
<td>39</td>
</tr>
<tr>
<td>Commision Calculations/Accounting</td>
<td>39</td>
</tr>
<tr>
<td>Premium Billing</td>
<td>36</td>
</tr>
<tr>
<td>Payroll</td>
<td>29</td>
</tr>
<tr>
<td>Premium Collections</td>
<td>29</td>
</tr>
<tr>
<td>Dividend Procedures</td>
<td>28</td>
</tr>
<tr>
<td>Premium Reserves</td>
<td>28</td>
</tr>
<tr>
<td>Policy Issue</td>
<td>24</td>
</tr>
<tr>
<td>Financial /Operating Reports</td>
<td>23</td>
</tr>
<tr>
<td>Automotive Rating</td>
<td>23</td>
</tr>
<tr>
<td>Actuarial Studies</td>
<td>23</td>
</tr>
<tr>
<td>State Book Reports</td>
<td>22</td>
</tr>
<tr>
<td>Underwriting Experience</td>
<td>21</td>
</tr>
<tr>
<td>Customer Billing</td>
<td>19</td>
</tr>
<tr>
<td>Accounts Receivable</td>
<td>18</td>
</tr>
<tr>
<td>Valuation of Reserves</td>
<td>18</td>
</tr>
<tr>
<td>Loan Accounting</td>
<td>16</td>
</tr>
<tr>
<td>Accounts Payable</td>
<td>15</td>
</tr>
<tr>
<td>Selective Underwriting</td>
<td>15</td>
</tr>
<tr>
<td>Claim Distribution</td>
<td>11</td>
</tr>
<tr>
<td>Expense Distribution</td>
<td>11</td>
</tr>
</tbody>
</table>

Source: Controllership Foundation Surveys