A Curvilinear Model of Trust and Innovation with Implications for China's Transition

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Problem

Innovation is an issue at the highest levels of the PRC government. President Jiang Zemin, in a national conference on technological innovation in Beijing, declared that technological innovation was a top priority to further improve China's national strength and social prosperity. During the same conference, Premier Zhu Rongji noted that China's economic growth has been inhibited by "backward technologies and limited technological development capability," and called for intensification of technological innovation in traditional industries as well as state-owned, technology-intensive enterprises (Larsen, 2000). Li (2001), however, attributed much of China's current industrial progress not to technological innovation but to increased labor efforts and more efficient organizations. He concluded that:

These results [of Li's study] indicate that developing countries can gain significant productivity growth without significant technological improvement. On the other hand, they imply that the reform of Chinese industries, even in the most economically vibrant area, is far from over. There will have to be a more difficult second stage to deal with the technological backwardness. This implication was true in the early 1990s and it is true today. In 2000, reforming deteriorated state industries is still the most difficult task for the Chinese government (107).

If China's industries could become more innovative, while continuing to increase their productiveness with organizational and labor efficiency methods, some of the competitive advantages now enjoyed by the West...
could shift in China’s favor. But how can an atmosphere of innovation be infused into cultures (national cultures as well as organizational cultures) that are commonly associated with such traditionally viable values as stability and conformity?

As in the west, many organizations in China find innovation to be problematic. Organizational climates of conservatism, conformity or traditionalism may slow the process of innovation adoption and, therefore, hinder competitiveness. Innovation is considered particularly important for the economic transition of China, at the town and village level (Naughton, 1994), in agriculture (Lin, 1991a), in joint ventures (Huang, Shroeder and Steffens, 1999), at the enterprise level (Wang, Z., 1994), at the provincial level (Sun, 2000) and at national levels (Wang, X., 1996). Sun (2000) found that innovation was not uniformly dispersed throughout China, but tended to be clustered in certain geographical areas, these being associated with co-located technical infrastructures (but not necessarily with R&D and foreign investment). Merrifield (2000) identified the innovation in U.S. industry as providing a major long-term competitive advantage over transitional countries such as China, in spite of its large excess industrial capacity and relatively low labor rates.

But is it realistic to think that China, with cultural and political values favoring stability and conformity, could foster a climate of innovation? In his final work, China’s Leap into the Information Age, Lu Qiwen (2000) provided six detailed case examples where Chinese enterprises, operating largely within contexts of government hierarchies and relying on relatively low levels of foreign influence or financing, were able to successfully innovate and complete with Western firms in emerging computer technologies. Lu attributed the successes of the six enterprises not to privatization or increased human effort, but to “non-governmentalization,” with managerial autonomy and financial independence appearing to play a greater role than privati-

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zation. Lu wrote:

“My case studies have shown that the leading Chinese computer enterprises that contributed the most to the rise of a viable Chinese domestic computer industry were not all privately owned in the sense of Western market economics. They were all, and still are, under some sort of state ownership.” (p. 189)

Some of the current Western innovation literature associates innovation with trust in organizations. The reasoning is that for individuals to assume the necessary risks of experimentation, they must trust that organizations will reward success and tolerate failure. Likewise, for managers to accept the risks of failure associated with innovation adoption, they must trust subordinates sufficiently to balance discipline with latitude.

Figure 1 illustrates a theoretical relationship between trust and innovation via the medium of relaxation of organizational control. Figure 2 illustrates its converse, linking distrust with conforming behavior through increased organizational control mechanisms. (Also suggested are negative side effects of the inappropriate application of control measures: Relaxation of restraint could result in negative lax behavior and increased restraint could produce rebellion or non-compliance.)

Managers with high trust in subordinates might only speak the word and expect the desired result to happen. There would be very little need for control measures such as supervision and auditing. Conversely, if organization managers were to have a low confidence in the predictability of their subordinates’ behaviors, they would be more likely to establish restrictions and constraints to reduce variation and help the organizational environment to be more predictable, more manageable or, in their perception, more trustworthy. A balanced atmosphere of trust and discipline among managers and organization members may be an important underlying factor in the encouragement of innovation adoption in organizations. While there are indications that these effects cross cultural and national boundaries.
there seems to be a lack of empirical evidence that this is so.

Perfect predictability would equal perfect conformity of behavior and, in the reverse, perfect unpredictability would result in chaos and confusion. Useful innovation is unlikely to be a product of either end of that continuum. I suggest that innovation and conformity are, by definition, almost exact opposites. Where there is a high degree of conformity, innovation suffers, and vice versa. However, with an optimum degree of organizational trust — balancing rigor and slackness, predictability and randomness, empowerment and oversight, confidence and caution, risk and reward, vision and practicality — there may be maximum innovation. This concept is similar to Fairtlough’s (2000) idea of an innovative organization:

Nowadays, successful innovation seems to require ‘loose-tight’ organization structures that provide both the freedom to create and the discipline to turn good ideas into commercial success. The loose-tight form has probably emerged through competitive pressures. Perhaps only these pressures could have forced people at the top of organizational hierarchies to become less controlling (p. 271).

In the context of China’s transition, the idea organizational controls as inhibitors of innovation come forth clearly. Lu (2000) attributed the inhibition of innovation, especially in the industrial sector, to constraints of centralized planning and organizational structures. He wrote:
The biggest problem, however, was the lack of innovation initiatives at the enterprise level. The priority of enterprise managers was to fulfill planned targets. They had neither the incentives nor the resources to engage in innovation, particularly product innovation, given the high uncertainties associated with it. (7)

The relationship between trust and innovation may also be nonlinear. Intuition tells us that minimum trust would certainly end in minimal innovation. In a coercive, suspicious environment, innovation that emerges is likely to be rare and self-serving. However, maximum trust may not result in maximum innovation. In a completely free-wheeling, unregulated environment, randomness and experimentation may spiral into chaos. Hardin (1993) is helpful in this regard, suggesting an optimum balance between trust and trustworthiness. In the case of innovation, there may be a point of optimization, where there is sufficient trust to enable the maximum innovation effects, but where, beyond that point, innovation decreases. Finding that optimum degree of trust would be important to any organization needing to adopt technical or organizational innovations. It could be particularly important for China’s transition.

The purpose of this paper is to suggest a methodological approach to empirically analyze organizational trust factors that may encourage or hinder innovation in organizations, both in China and in the west. I first examine concepts of trust and innovation, as well as their intersections, in order to show how these two concepts have been linked western literature, as well as some eastern literature. Next I review the conduct and findings of a consulting project where I attempted to empirically relate organizational trust with incidences of innovation in California hospitals. I examine the findings of that project, not to generalize the findings themselves to China’s context, but to show the viability of a curvilinear regression methodology for looking at trust and innovation. I argue for a curvilinear model as being more realistic in identifying optimal solutions and as being more in tune with eastern cultural paradigms.

Literature

Trust has been described as a fundamental ingredient for collaboration among organizations (Lewicki, McAllister and Bies, 1998). “The essential ingredient of collaborative effort is trust.” (Costigan, Ilter and Berman, 1998, 303) Levels of trust in organizations can be causally related to collaborative climates that encourage innovation (Ruppel and Harrington, 2001). But the relationship between a climate of trust in organizations and the actual adoptions of innovations is still unclear. Whether or not organizational environments are indeed capable of substantially encouraging or inhibiting innovation with trust or trustworthiness is a matter of controversy.

The consequences of management control measures may fall on a continuum ranging from perfect predictability at one end to total unpredictability at the other. Tushman and O’Reilly (1999) suggest that an organizational balance between efficiency and innovation may require an internal contradiction of management styles, balancing trust and control:

Organizations can sustain their competitive advantage by operating in multiple modes simultaneously-managing for short-term efficiency by emphasizing stability and control, and for long-term innovation by taking risks and learning by doing. Organizations that operate this way may be thought of as ambidextrous-hosting multiple, internally inconsistent architectures, competencies and cultures, with built-in capabilities for efficiency, consistency and reliability on the one hand, and experimentation, improvisation and luck on the other (p. 20).

Classifications of Trust

The three stage model, from Shapiro, et al. (1992) and Lewicki and Bunker (1995) is a convenient way to view managerial trust in organizations. The stages are 1) calculus-based trust — trust based on deterrence, 2) knowledge-based trust — trust based on information, and 3) identity-based trust — trust based on common values and affiliations. Each stage will be discussed
and related to examples of trust literature.

**Calculus-Based Trust**

Lewicki and Bunker (1995) described calculus-based trust as being based on perceived benefits and consequences, balanced by the costs of continuing in the relationship. It is a trust based on deterrence or the balance of consequences perceived by the trustor and trustee. Behavior control and manipulation of the other are its hallmarks. Consistency is assured by making inconsistency undesirable. Defections may be tolerated in a continuing relationship if positive consequences outweigh negative ones. Similar to the conditional trust of Jones and George (1998), calculus-based trust is often reappraised or recalculated, depending on the willingness of the parties to assume risks of exploitation or betrayal.

Doney, et al. (1998) similarly incorporated a calculus-type trust within their cognitive framework, describing behavior of the trustee that can be predicted by the trustor, based on the assumption that individuals tend to act opportunistically. People act trustworthily because it is in their interest to do so. Calculus-based trust is characterized by short-term expectations and circumstantial contingencies. The relationships are fragile and recalculated based on violations. The parties trust each other as long as their respective interests are served (Lewicki and Bunker, 1995).

**Calculus-Based Trust Related to Innovation**

**Risk Acceptance.** Trust involves risk — often calculated risk. An organizational environment of distrust may result in a culture of risk aversion among employees. Inhibitors of innovation are reported to be such factors as fear of failure, reluctance to change, fear to commit finances or organizational inertia. Risk acceptance means purposefully allowing experimentation and removing deterrents to variation. If employees are to experiment, innovate, and adapt, there must be an acceptance of a margin of error by management. Kanter (1984) noted that “innovating companies pro-

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Innovation may be countered by risk aversion.

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Innovation may be countered by risk aversion. Silver and Mitchell (1990) observed a strong tendency among many decision-makers to cling to the status quo in spite of the perception of better alternatives. Only when the status quo began to clearly fail were imaginative alternatives seriously considered. Ryan and Oestreich (1991) observed incidences where a risk-averse attitude became the organizational norm, resulting in decreased innovation. Ironically, Kanter (1984) associated innovation with “benign neglect” of managers who allowed subordinates to experiment (p. 96-97). In another case, a wide separation between potential innovators and the core functions of the organization created a permissiveness that allowed innovation to occur.

**Financial Discretion.** Financial discretion implies having resources to risk and trust in the discretion to spend them. Nohria and Gulati (1996) found both positive and negative relationships between organizational “slack” resources and innovation. Delbecq (1995) also identified centralization of slack funds for experimentation as being detrimental to the promotion of innovation. Chandy and Tellis (2000) found that, contrary to established wisdom, large firms with R&D investments were at least as innovative as smaller, more flexible firms, also concluding that risking existing assets is a key to radical innovation (Chandy and Tellis 1998). Similarly, Chandrashekaran et al. (1999) suggested that the lack of innovation may be related to the unwillingness of an organization to divert from investments in current products. Coyne (1999) attributed part of 3M’s success in innovation to substantial R&D investments and Albert (1995) considered existence of R&D departments as an indication of an organizational commitment to innovate. In China, Lu (2000) found substantial association between financial independence and the ability of managers to make innovative decisions.

**Management Autonomy.** Lin (1991a) associated increased agricultural innovation in China with deces-
mercialization of public research institutions. Jansen and Chandler (1994), for instance, argued that punishment and disapproval tends to increase fear and conformity, thus lessening innovation. According to Qian and Xu (1998), centralized bureaucratic prescreening of projects may elevate the costs of innovation. Lu (2000) also attributed managerial autonomy as a factor for innovation in China. He associated constrained innovation with centralized planning by government agencies, causing enterprise managers to be preoccupied with fulfilling planned targets:

With no incentive for enterprise managers to innovate, any significant innovation within the centrally planned system had to come from the central planning apparatus. Yet due to information and resource constraints, the central planning authorities could only initiate a limited number of innovative projects (p. 7).

At a higher organizational level, centralized national economies tend to start fewer innovation projects than decentralized economies. Amburgey, Kelly, and Barnett (1993), Taylor (1992), Damanpour (1991), and Schon (1971) all found formalization or rigidity in organizations tending to inhibit innovation. Delbecq (1995) and Bartlett and Ghoshal (1995) associated rigorous strategic planning with decreasing innovation, while Hitt et al. (1996) found that innovation within companies was negatively affected by activities of acquisition and divestiture.

Knowledge-Based Trust

While exercise of control characterizes calculus-based trust, exchange of information fuels knowledge-based trust. Calculus-based trust relies on deterrence; knowledge-based trust is conditioned upon how well the truster can understand and predict the trustee’s actions. “The better I know the other, the better I can trust what the other will do because I can accurately predict how they will respond in most situations” (Lewicki and Bunker, 1995, p. 149). Several aspects of the cognitive model described by Doney, et al. (1998) also align with knowledge-based trust. The more the truster could know about trustees, the more effectively their behaviors could be predicted or anticipated. The known experiences of the past are relied upon to predict the future. Similarly, Costigan, I iter and Berman (1998) discussed cognitive and affective trust as two dimensions of “dyadic” or interpersonal trust. Cognitive trust, by their definition, is trust formed as a rational choice based on knowledge.

Knowledge-Based-Trust Related to Innovation

The sharing and gathering of information through meetings, networking and information exchange may function to promote an atmosphere of knowledge-based trust and, hence, innovation. In the literature, innovation has been linked with socialization and the exchange of information. Without considerable information and collaboration, innovation cannot be diffused and adopted. The strength of innovation seems to be closely tied with the benefits of collaboration, teaming and social interaction.

Fairtlough (2000) described an innovative organization where “Information is freely shared, there are high levels of trust, and everyone is bound together by a deep understanding of and commitment to organization goals” (p. 271). He further suggested that even such mundane measures as the layout of the workplace or the locations of restrooms can encourage exchange of information, thus encouraging the idea-sharing necessary for innovation.

The awareness and knowledge of an innovation occurs more rapidly than its adoption, according to Rogers and Shoemaker (1971). Further, if an innovation is perceived by members of a social system to be compatible with existing ideas, even more rapid adoption could be expected. Therefore, information sharing and networking plays a large role. Lin (1991b) found

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innovation adoption of rice hybrids increasing with education levels. Powell, Koput, and Smith-Doerr (1996) found that innovation is related to maintenance of organizational relationships. No single organization has sufficient information to keep pace with all the technological advances. Goes and Park (1997) found that technical and product information-exchange in hospitals led to increased diffusion of innovations among individual facilities. Hitt, Hoskisson, and Kim (1997) described a relationship between the international diversity of companies and increased innovation, due to more information exchange from a wider array of sources.

The necessity of information sharing in solving innovation-related problems was explained by von Hippel (1988). Required information tends to be difficult to transfer from one situation to another. As information becomes harder to transfer, iteration of information increases and the costs associated with the innovation rise accordingly. Other linkages between information exchange and innovation were also found by Daft and Becker (1978), Tsai and Ghoshal (1998), Utterback (1994), and others. Knowledge and information, linked to trust by Shapiro, et al. (1992), were also found necessary for innovation by the writers above. Especially pertinent to Chinese culture is the concept of relationship-building, associated by Li and Atuahene-Gima (2001) with product innovation strategies in China. They hypothesize that strategic alliances for product development influence product innovation and technology ventures.

**Identification-Based Trust**

Lewicki and Bunker (1995) described identification-based trust as a product of mutual understanding. Each party understands the other and also understands what is required to maintain the relationship of trust. "At this level of trust, trust exists because the parties effectively understand, agree with and endorse each other's wants; this mutual understanding is developed to the point that each can effectively act for the other." (p. 151) The parties are bonded by common identities, locations, goals or values. According to Doney, et al. (1998), trust could also be transferred, based on referral or association. If a known person could be trusted, a person with similar affinity could also be trusted. They identified this type of trust as being more prominent in cultures with more faith in institutions and other individuals.

Similarly, Atwater (1988) demonstrated that attitudes of trust and loyalty among subordinates and superiors were predictors of supportive and demanding supervisory behaviors, noting that "the more trust and loyalty expressed by subordinates toward their supervisor the more positively the supervisor was perceived to behave" (p. 305). Ruppel and Harrington (2000) found a clear relationship between an ethical work climate and communication. Principle-oriented cultures, influenced by an ethical tone set by management, may promote open communications, which is further linked to trust. Conversely, ethical climates emphasizing parochial interests or organizational interests subsuming individual consequence tended to inhibit communications and, thus, trust.

Identity-based trust may vary with cultures and world views. According to Fukuyama (1995), trust and distrust may differ in various national cultures according to differences in social structures and family relations. In his view, the phenomena of trust in Japan may extend to corporate structures, while in China the kinship network may be more important.

The reason, in my view, has to do with the fact that such groups have a narrow radius of trust. In-group solidarity reduces the ability of group members to cooperate with outsiders, and often imposes negative externalities on the latter. For example, in the Chinese parts of East Asia and much of Latin America, social capital resides largely in families and a rather narrow circle of personal friends. It is difficult for people to trust
those outside of these narrow circles. Strangers fall into a different category than kin; a lower standard of moral behavior applies when one becomes, for example, a public official. This provides cultural reinforcement for corruption: in such societies, one feels entitled to steal on behalf of one's family (Fukuyama, 1999).

Identity-Based Trust Related to Innovation

Identity-based trust is associated with the sharing of values and vision among the participants of a trusting relationship (Lewicki and Bunker, 1995). With an empowered and enlightened leadership, organizations promote a climate of identity-based trust, where partners act upon one another’s behalf. By empowering subordinates, leaders say, “You are one of us.” Leaders, promulgating elevated goals, clear visions and strong values, are associated with sustained innovation in an organization.

Empowerment. Linden (1994) defined effective empowerment as “greater authority and control, with greater responsibility for results” (p. 211). Randolf (1995) described empowerment creating autonomy in the organizational hierarchy and allowing teams of employees to become the new hierarchy. Bartlett and Ghoshal (1995) observed innovation occurring in independently-empowered sub-organizations in spite of the bureaucratic restraints of the larger organization.

Formality of empowerment may not be as important as the reality of empowerment. Thorlakson and Murray (1996) found that formal implementation of empowerment measures do not necessarily yield the predicted innovation-encouraging effects such as perceptions of improved communication, work-group cohesiveness, or management styles with the needed flexibility. According to Kanter (1984), monetary rewards do not motivate entrepreneurial behavior as much as the perception of being empowered to act. She wrote that, “people tackle innovative projects because they have finally received the go-ahead for a pet idea they have always wanted to try, or they feel honored by the organization’s trust in them ... or they simply want to solve a problem that will remove a roadblock to something else they want to do” (p. 153-154).

Maccoby (1991) also found that the creation of a sense of team empowerment and purpose is more effective than monetary reward in motivating innovation. He analyzed motivating factors of individual innovators, proposing that satisfaction is attained in the process of understanding and creating, rather than in receiving intrinsic rewards. Further, empowerment and management commitment can theoretically reinforce and sustain innovative behavior. Delegation of power is an investment in commitment that is necessary for innovation.

Leadership. The sharing of values is an aspect of identity-based trust (Lewicki and Bunker, 1995). Visionary, value-oriented leadership is also often mentioned in conjunction with innovation. Tsai and Ghoshal (1998) found shared vision to have an indirect effect on innovation through its promotion of a sense of trust. Howell and Higgins (1990) studied leaders considered to be innovation champions and non-champions and compared their behaviors and levels of effectiveness, suggesting that the innovative success of champions depended upon their capacity to articulate vision, express confidence in others, and model innovative actions. Delbecq (1995) and Dougherty and Hardy (1996) also recognized the contribution of power-wielding and committed champions.

Several researchers emphasized the motivational benefits of appealing to the value systems of potential innovators. Innovative organizations are known for having evident and pervasive value systems. Schneider, Gunnarson, and Niles-Jolly (1994) described the innovative climate of 3M Corporation as reflecting the priorities of management for change, customer focus, and employee entrepreneurship. Kanter (1984) described organizations with innovative cultures as having a pride in the company and a sense that innovation is one of the core values. Leadership that promotes innovation is not limited to leadership from the “upper rungs” of the organizational hierarchy, according to Shane (1995). He defined the following four championing roles as valuable to the innovation process: (1) the organizational maverick, (2) the transformational leader, (3) the organizational buffer, and (4) the network facilitator. Each of these roles is instrumental in providing power, information, and resources at different stages of the innovation process.
Typologies of Innovation

Becker and Whisler (1967) differentiated inventions — creative acts of individuals — from innovations, the latter defined as collective actions of groups. Daft and Becker (1978) distinguished between early adoption, innovation and imitation. Mohr (1969) also made a distinction between innovation and invention, invention being a new creation and innovation a new application. Others extended the definition of innovation to new skills (Nilsson, 1995), unique corporate strategies (O’Neill, 1993), and end products of an organizational learning process (Watkins and Marsick, 1993). Kanter (1984) went even farther:

Innovation refers to the process of bringing any new, problem-solving idea into use. Ideas for reorganizing, cutting costs, putting in new budgeting systems, improving communication, or assembling products in teams are also innovations. Innovation is the generation, acceptance and implementation of new ideas, processes, products, or services (p. 20).

Innovation is classified by type of product (Kleinknecht, 1987), degree of system complexity (Chesbrough and Teese, 1996), degree of innovation complexity (Fleck, 2000), degree of inventiveness (Altschuller, 1984), degree of radicalism (Henderson and Clark, 1990), and according to product, service, and delivery categories (Kim and Mauborgne, 1997). Altschuller (1984), Haveman (1992) and Ziman (2000) characterized innovation as an evolutionary process analogous in many ways to Darwinian and Lamarckian biological evolution models, driven by natural selection, random variation and inheritable traits.

Van de Ven (1986), argued strongly against any inappropriately fragmented classification of the innovation process. Drazin and Schoonhoven (1996) pointed to a lack of consensus among scholars, commenting that researchers generally agree on the benefits of innovation, but not on definitions or classifications of innovation. They commended Daft (1986) for his innovation typology, which included technological, administrative, human-resources, and product/service innovations. Technological innovations are defined as those that would increase production or quality of products or services. Administrative innovations concern organizational structures, goals, or performance systems. Human-resources innovations would improve or change employee attitudes or behaviors including communication, group interaction and problem solving. Product/service innovations are changes in the organizational output to customers, involving new products or new markets. I use Daft’s (1986) scheme to classify narrative reports of innovation adoption in hospitals.

Summary of Literature

Clearly, the literatures of trust and innovation overlap, in western literature as well as some references to China. But both subjects suffer from the lack of precise definitions and consistent, clear typologies. Nevertheless, if organizational climate factors are viewed as attempts by management to create atmospheres of trust, then perhaps a way opens to more clearly connect trust with innovation in organizations. The remainder of this paper will explore ways that trust/innovation relationships can be empirically demonstrated.

Methodology

To provide a working example of how factors of trust can be related to innovation, I draw on a consulting project that I helped to conduct. The findings are limited in scope and precision, but the methodological and analytical approaches seem promising for implementation of future studies, either in the United States or China.

The study itself was sponsored by the Center for Health Services Management Research (CHSMR) and the University of La Verne, surveying ten Southern California hospitals (n=870) (Herting, 2000). The “Environment for Innovation” instrument developed by Badger (1992) was used to measure perceptions of organizational climate factors, along with collected narratives of observed innovations from the respective hospitals. 1,782 narrative responses were classified.
using Daft's (1986) framework. The innovation reports were classified into 606 technical, 374 administrative, 426 human-resources, and 440 product/service innovations, using pattern matching as prescribed by Yin (1994). All reports of innovation were weighed equally and were not evaluated for originality or importance. I reframed the innovation factors from the Badger (1992) instrument into a theoretical construct based on the three stages of trust from Shapiro, et al. (1992).

**Calculus-Based Trust**

Calculus based trust questions included management incentives, deterrents, policies, formalities or organizational structural features that would suggest increasing (or decreasing) predictability of actions, including questions that suggested removal of direct management intervention, management risk acceptance, formal suggestion programs, formal training, formal recognition processes, allowed time, rules suspension and the flattening of organizational structures. These items were categorized as such for their deterrent characteristics, based on characteristics of formality, policy implementation or direct management intervention.

**Knowledge-Based Trust**

Questions were categorized as evidence of knowledge-based trust depending on their information and networking content, suggesting evidence of management activities to encourage (or inhibit) the flow of information and perceptions. Factors in this category included routine information gathering, product evaluation processes, environmental scanning, strategic planning, perceptions of hospital stability, communications of hospital expectations, use of attitude surveys, promotion of networking, frequency of meetings, frequency of workshops, and other information-loaded climate factors.

**Identity-Based Trust**

Identity-based trust questions were selected for their teamwork and organizational affinity characteristics. Items selected included evidence of vision sharing, values sharing, attitudes of commitment, interest in innovation, excitement in the workplace, feelings of job security, a sense of community contribution, and inclusion of stakeholders. These suggested actions or behaviors that furthered a sense of organization affinity within the hospitals.

**Dependent Variables:**

**Reported Instances of Innovation**

Innovations were counted from narrative descriptions and classified into one of Daft's four categories by pattern matching. Reported innovations were classified as follows:

**Technical Innovations**

Technical innovations were classified as those innovations that render the production process more efficient or productive. These were selected as they related to procedures, processes, equipment, techniques, or technology. In hospitals, these included such items as new computer systems, new medical procedures, new record-keeping methods, process improvement initiatives, new equipment, etc. The selection criteria was process or technology-focused.

**Administrative Innovations**

Administrative innovations involve the management processes of the organization, including examples of innovation that relate to organizational structures, organizational relationships, hospital membership, and administrative policies. Innovative items that fell into this category included reorganizations, mergers, organization restructuring, hospital partnerships, hospital board changes, staffing plans, strategic plans, etc. The classification criteria focused on various aspects of the organizational infrastructure.

**Human Resource Innovations**

Human resource innovations were defined as those innovations that influence changes in the attitudes, skills, beliefs, expectations, or behavior of employees.
including items that relate to human-resources policies, teamwork, motivation, leadership, team membership, and employee relations. Examples selected included new training events, promotional possibilities, recognition systems, cross-training programs, gain-sharing programs, equal opportunity programs, etc. Items were classified in this category based on their leadership, motivational or educational content.

**Product/Service Innovations**

Product/service innovations were outputs of the hospital organizations—related to new products, services, or new features that were made available to customers and end users. Examples of these were new hospital services, community outreach programs, hospital events, shifts to out-patient care, treatment programs, marketing campaigns, care units, etc. The emphasis for this category is on the customer. In general, innovations in the other three categories involve processes or structures internal to hospital organizations; product/service innovations are outputs of the hospital.

**Findings of the Consulting Project**

**Trust and Innovation Correlate:**  
**Evidence of a Linear Relationship**

The table of correlations (Table 1) suggests that the stages of trust (calculus, knowledge and identity-based trust) appear to positively correlate with administrative innovations only. Calculus-based trust was negatively associated with product/service innovations. No significant association is found with either technical or human-resource innovations. It should also be cautioned that, because of the unknown degree of randomness in selection of respondents from the hospital populations, that the confidence values (p) must be considered illustrative.

The association of trust with administrative innovations tends to confirm some of the literature, if narrowly applied to administrative innovations. Socialization determinants of innovations seem apparent in these findings. Connections of innovation with group cohesion and trust, as proposed by Rogers and Shoemaker (1971), Lewis and Seibold (1993), and Tsai and Ghoshal (1998) are also corroborated.

The correlation between the trust stages and administrative innovations may be partly explained by the selection of the survey items themselves. These items tend to refer to administrative types of initiatives such as management actions, goals, objectives, policies, processes, assessments, reviews, meetings, and plan

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**Table 1: Correlation Coefficients among Variables of Trust and Innovation (n = 42)**

<table>
<thead>
<tr>
<th>Innovation Types</th>
<th>Calculus-Based Trust</th>
<th>Knowledge-Based Trust</th>
<th>Identification-Based Trust</th>
</tr>
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<tbody>
<tr>
<td>Technological</td>
<td>.156</td>
<td>.205</td>
<td>.082</td>
</tr>
<tr>
<td>Administrative</td>
<td>.457**</td>
<td>.480**</td>
<td>.385*</td>
</tr>
<tr>
<td>Human Resource</td>
<td>.155</td>
<td>.187</td>
<td>.126</td>
</tr>
<tr>
<td>Product/Service</td>
<td>-.379*</td>
<td>-.232</td>
<td>-.220</td>
</tr>
</tbody>
</table>

(**p<.01, *p<.05)**

Figure 3: Yerkes-Dodson Curve (1908) Adapted to the Show a Theoretical Relationship between Trust and Innovation
formations. These factors could be considered administrative innovations in and of themselves. It may be that past administrative innovations are good predictors of future administrative innovations. Amburgey, Kelly, and Barnett (1993) suggested that organizations with a history of change and innovation can be expected to continue to innovate and, conversely, those with a history of inertia are likely to cling to the status quo. O’Neill, Pouder, and Buchholtz (1998) discussed the idea of “organizational memory,” in which past experiments precondition future innovation activities. Lewis and Seibold (1993) viewed innovation as habitual within organizations.

However, the three-stage trust construct does not correlate as well to the other three types of innovations. Some of this effect can be attributed to the design of the survey instrument, the relatively small population or the limitations of the study. The significant negative association between calculus-based trust and product/service innovations raises serious questions. Could it be that too much trust and openness would work against the discipline needed to bring a new product to market or to establish a new service? It may be that organizational-climate factors commonly associated with trust only enable certain types of innovation and are inert, or even obstructive, toward other types. In any case, the correlative approach still does not appear to yield satisfactory results. Perhaps the error is in assuming a linear relationship, where maximum trust is associated with maximum innovation. An alternative model may explain the relationship better—a curvilinear model.

**A Nonlinear Association between Trust and Innovation**

A curvilinear relationship between trust and innovation, depicted in Figure 3, is
suggestive of the classic Yerkes-Dodson curve (1908) from psychology, where performance increases with increased stimuli but reaches an optimum point, thereafter decreasing, even though stimuli continue to increase. I theorize that innovation similarly increases with organizational trust to an optimal point, after which innovation levels off and decreases even as trust continues to increase. With extreme trust, roles and rules may become so ambiguous that rigor and discipline would be diminished, and new ideas would never be realized or implemented.

For instance, Coyne (2001) reported that 3M Corporation’s employees are entrusted with 15 percent of their work time to be devoted to individual projects of their choice, a successful policy to encourage innovations. This would be an example of organizational trust, evidenced by the removal of restrictive work rules, resulting in innovation. However, would entrusting employees with more work time result in even more innovation? Would 30 percent work time result in double the production of innovations? If employees were allowed 100 percent of their work time for nothing but self-directed innovative projects, would innovative products go up 600 percent? Or could it be that 3M Corporation has discovered that 15 percent is the optimum amount of work time to be allocated to employees, to enable the maximum number of innovative products?

**Evidence of a Trust-Innovation Curvilinear Relationship**

The CHSMR study described above provides some scattered evidence for a Yerkes-Dodson effect in regards to a trust and innovation relationship. Flatness of organization, (which I classified as a calculus-based trust element) appeared to relate in this way to numbers of product/service innovations. Although the fit of the quadratic equation is significant only at $p = .19$, Figure 4 pictorially illustrates the possible curvilinear relationship.

As depicted in Figure 4, if the organization is perceived (“strongly disagree”) not to be flat, then there are also few reports of innovation. Conversely, if the organization is emphatically (“strongly agree”) perceived to be flat, there also appear to be few innovations reported. However, at some point in the middle of the continuum, where the data imply there may be either disagreement or lack of knowledge about the flatness of the organization, maximum product/service innovations are reported. As is apparent, the $R^2$ for the model is not significant, partly because of the small population and a few extreme values of innovation reports.

Similarly, Figure 5 displays a non-linear relationship between involvement of midmanagers in innovation and reports of all types of innovation in hospitals. The quadratic equation suggested by these data is significant at $p < .01$. Interpreting this figure, when midmanagers are uninvolved with innovation, few innovations are reported by organization members. However, perhaps when midmanagers become intrusively involved, also few innovations are reported. In between is the “Golden Mean,” where there is an optimum involvement by midmanagers, resulting in the greatest number of innovations reported. Similar non-linear relationships are displayed between midmanager involvement and technical innovations (Figure 6) and with human resource innovations (Figure 7).

An interesting variation on the curvilinear theme may be its inverse. Consider Figure 6 below, showing a non-linear relationship ($R^2 = .341, p < .01$) between employee risk taking and reports of human resource innovations. In this case, the equation predicts two optimum levels of innovation occurring at both ends of the trust continuum, while the mid-point in the continuum shows fewer reports of innovation. The curve appears to be the inverse of the Yerkes-Dodson model. Perhaps the interpretation in this case could be that risk encouragement distinctly spelled out results in innovation. Employees know how much or how little risk is tolerated, and act accordingly. However, if a risk tolerance policy is ambiguous or uncertain, employees would assume the worst and therefore be less innovative. Similarly, figure 7 may imply that clear perceptions of financial stability (or the lack thereof) may be more associated with innovations than mixed perceptions.

**Conclusions**

Empirical findings from the consulting project data suggest the possibility that organizational trust may
correlate linearly with innovation among the study’s California hospitals, particularly with administrative innovation, depending upon the degree and categories of trust. The findings also suggested the possibility that different types of innovation may be encouraged by very different climates of organizational trust. Product/service innovations especially seem to be found in distinctly different trust climates from technical, administrative or human resource innovations. Some of the product/service innovation findings suggest limitations to a linear relationship model. These findings, of course, were very preliminary and subject to the limitations of the study. Whether they would be replicated in other situations, either in the United States or China, is a matter of conjecture. However, future studies in broader settings, applying a similar methodological approach and using well-controlled primary data would likely uncover clearer relationships. In China, where a pressing need is apparent to identify determinants of innovation, application of this approach may prove to be especially fruitful in the identification of optimum organizational climates of trust and control in various settings.

The visual patterns formed by some data suggest that a nonlinear model may also be useful for examining trust and innovation. The Yerkes-Dodson curve may be a good starting point for future research. Intuitively, there could be too much trust in an organization, inappropriate to the degree of trustworthiness of members or the necessity for control, as suggested by Hardin (1993) and Tushman and O’Reilly (1999). When the trust levels exceed appropriate levels, then side effects could overcome innovative benefits, in the same way that excessive doses of vitamins could be detrimental to health. Much of the innovation literature
implies a linear regression model with a regression line vectoring toward infinity. From a practitioner’s point of view, it would be more useful to know the optimum balance between organizational trust and management control that would produce the maximum benefits of innovation, perhaps empirically operationalizing Fairtlough’s (2000) loose-tight organization or Tushman and O’Reilly’s (1999) ambidextrous organizations. It may be useful in pinpointing the “causal linkages between the structure of enterprise governance and the mode of technological learning and innovation,” suggested by Lu (2000, p. 190).

The use of a nonlinear regression model to study the trust/innovation relationship shows promise. Taking into account the limitations of the data, the feasibility of identifying a quadratic regression model similar to the Yerkes-Dodson curve is clear from the few examples shown above (Figures 2-5). The inverse model (suggested in Figures 6 and 7) is intriguing and merits more examination. Larger populations and better control of data could demonstrate the benefits of this approach more clearly.

The relationship between organizational trust and innovation adoption can be a fruitful way of viewing organizations as they adapt to survive. Many organizations desire or require more innovation and change. With a revised survey instrument, a randomized survey, a larger study population, and development of hypotheses based upon nonlinear models, much more could be learned about the trust/innovation connection. A great improvement would be in the observation of innovations. Evidence of innovations themselves should be more closely examined and more carefully classified, not only according to type of innovation, but also by degree of “innovativeness,” perhaps...
following Altschuller's (1984) levels of solution approach. This paper drew from a study on hospitals, but I recommend that future research could be applied to industries beyond health care and in cross-cultural settings.

As for China's transformation, the curvilinear model may be helpful in research concerning the relationship between trust and innovation, in identifying optimal organizational settings for necessary innovation adoption. In this writer's opinion, there is a Western selection preference for linear regression models to analyze and explain organizational phenomena (like trust and innovation), as evidenced by the very common use of linear models in Western social science literature and analysis (especially since the introduction of easy-to-use PC statistics programs). Preference for a linear regression model, I feel, reflects a Western preference for maximization ("the bigger, the better") that may not be applicable to the association of trust and innovation. Optimization rather than maximization of organizational climate attributes, implied by the curvilinear examples shown above, has more of an Eastern flavor. It suggests parallels with Golden Mean of Confucius and other ancient philosophers, in their advocacy of a harmonious middle way, with avoidance of extremes at either end of a continuum. Indeed, neither an extreme release of organizational restraints (total trust) nor a draconian imposition of controls (total distrust) would seem at all reasonable in an Eastern setting. Perhaps the notion of an optimal balance between constraint and trust, as well as between conformity and innovation, with all producing a maximum net benefit, would be not only more compatible with a Chinese cultural paradigm, but it would also be more useful in understanding innovation adoption behavior, even in the West. The analysis should be appropriate to the phenomena being examined; the phenomena should not be distorted to fit the analysis. I am reminded of the Chinese proverb: "[Don't] trim the toes to fit the shoes (????)" (Chen, 1981, p. 467).

**Limitations**

The value of this paper is in its methodological approach rather than in its empirical findings. The latter should be viewed illustrative. The research design and data collection instrument were developed for different purposes than that of this paper. The example consulting project involved essentially secondary data, aggregated to the group level with no assumption about randomness or control of the survey responses. The population was substantial, but membership in the population was probably arbitrarily determined by the participating member hospitals. Each innovation report was classified at face value with no attempt at verification. Taken together, the empirical findings cannot be generalized, although the general methodological approach, with refinements, holds promise for future research.

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