

TOP MANAGER AND NETWORK EFFECTS ON THE ADOPTION OF INNOVATIVE MANAGEMENT PRACTICES: A STUDY OF TQM IN A PUBLIC HOSPITAL SYSTEM

GARY J. YOUNG,^{1*} MARTIN P. CHARNS¹ and STEPHEN M. SHORTELL²

¹Management Decision and Research Center, Veterans Affairs Health Services Research and Development Service, Boston, Massachusetts, U.S.A. and Program on Health Policy and Management, Boston University School of Public Health, Boston, Massachusetts, U.S.A.

²Division of Health Policy and Management, University of California, Berkeley, California, U.S.A.

This paper reports findings from a study that combined two theoretical perspectives—top manager and network/institutional—to examine the factors influencing organizations to adopt innovative management practices. The study setting was a system of public hospitals and the innovation was Total Quality Management (TQM). Study results indicate that both top manager and network/institutional factors are important determinants of whether and when organizations adopt innovations. However, as predicted, the relative importance of these two sets of factors appears to change as an innovation becomes more widely diffused. Copyright © 2001 John Wiley & Sons, Ltd.

The study of strategic management has long been concerned with understanding factors that promote an organization's openness to innovation and change. In this paper, we report findings from a study that combined two leading theoretical perspectives on this topic: the top manager perspective and the network/institutional perspective. The top manager perspective emphasizes the importance of an organization's top managers, particularly the managers' personal characteristics (cf. Kimberly and Evanisko, 1981; Buckholtz and Ribbens, 1994; Bantel and Jackson, 1989; Hambrick, Geletkanycz and Fredrickson, 1993; Boeker, 1997a; Hambrick and Mason, 1984). By contrast,

the network/institutional perspective emphasizes the importance of an organization's social context in the form of network arrangements (cf. Burns and Wholey, 1993; Westphal, Gulati, and Shortell, 1997; DiMaggio and Powell, 1983; Meyer and Rowan, 1977; Scott, 1995; Majumdar and Venkataraman, 1998).

Although both perspectives have attracted much interest among management researchers, there has been little systematic study of each perspective's relative contribution to our understanding of whether and when organizations adopt innovations (Drazin and Schoonhoven, 1996). Several studies suggest an important role for top managers, but leave largely unanswered the question of whether top managers' personal characteristics are more or less important than the network arrangements in which their organizations are embedded. Consequently, senior officials in the private-

Key words: innovation; adoption; top manager; diffusion; networks; institutional forces

*Correspondence to: Gary J. Young, Boston University School of Public Health, Health Services Department, 715 Albany St., T-3 West, Boston, MA 02118-2526.

and public-sectors lack guidance as to where they should focus their efforts when attempting to diffuse innovations among organizations. To extend the literature, we addressed as a primary theoretical issue for our study the relative importance of top manager and network/institutional factors regarding whether and when organizations adopt innovations. We addressed this theoretical issue by examining patterns in the adoption of an innovative management practice, Total Quality Management, within a system of public hospitals.

STUDY SETTING

Background on Veterans Health Administration

The study setting is the Veterans Health Administration (VHA), the health care component of the U.S. Department of Veterans Affairs. VHA is a centrally financed health care system for veterans. It is also one of the country's largest health care systems with currently over 150 hospitals across the U.S. In fiscal year 1999, VHA operated with a budget of over \$17 billion and employed approximately 180,000 individuals nationwide (Kizer, 2001; VHA internal documents).

During the study's time frame (1989–1998), each VHA hospital had a director who was responsible for the hospital's activities.¹ These hospital directors were the top managers for the purpose of our study. Each director reported ultimately to the VHA Chief Medical Director, the highest ranking official in VHA.²

As a setting for studying patterns in the adoption of innovations among organizations, VHA offered several important advantages. One advantage was the opportunity to study organizations that are embedded in a diverse set of network arrangements. Because VHA hospitals are embedded in multiple network arrangements within and outside

the VHA system, we were able to assess the importance of different types of network arrangements in relation to top manager factors. Another advantage was the availability of data. VHA maintains a variety of centrally managed data sets that provide hospital-specific information on top manager characteristics and network arrangements. As an additional advantage, during the study time period VHA hospitals were relatively well insulated from factors that could potentially confound empirical analyses. Although VHA hospitals have always differed on a number of theoretically relevant attributes, they have long shared a common operating environment with respect to most financial and regulatory conditions.

TQM as an innovative management practice within VHA

This study focused on the adoption of Total Quality Management (TQM) as an innovative management practice within VHA. Rogers, a leading authority on the diffusion of innovations, defines an innovation as "any idea, practice or object that is perceived to be new by an individual or other unit of adoption" (1995: 11). From this perspective, the idea or practice need not constitute new knowledge to be innovative. A potential adopter may be an individual (or organization) who has had knowledge of a practice for a long time but has not yet reached a decision to adopt it or reject it. Nor must the idea or practice produce positive results (from the adopter's point of view) to be an innovation.

For purposes of our study, we approached innovation from the vantage point of the potential adopter. The potential adopter was the VHA hospital. During the study period, TQM represented for VHA hospitals both an innovative philosophy and set of practices for improving the quality of health care services. VHA hospitals, historically, have focused on traditional quality assurance practices for health care (Barbour *et al.*, 1996; Lammers *et al.*, 1996). Such practices are oriented to correcting errors or defects after-the-fact and to identifying individuals responsible for the errors (Barbour *et al.*, 1996; Tindill, Al-Assaf, and Gentling, 1993; Shortell *et al.*, 1995).

TQM, which originated in manufacturing, stands in sharp contradiction to traditional approaches to quality assurance in the health care industry. While several schools of thought have developed around TQM, the literature points to three defining

¹ In addition to the hospital director, at the time of the study each VHA hospital had an associate director as well as a chief of staff who had responsibility for clinical policy. Although the associate director and chief of staff might also be considered top managers, we focused on the directors' characteristics only. We chose this focus because, based on interviews we conducted with VHA staff in preparation for the study, the directors were the key decision makers within the hospitals for adopting management practices such as TQM.

² The title of this position has since been changed to Under Secretary for Health. We use the former title throughout this paper.

principles: (1) an explicit focus on satisfying customers, (2) a commitment to quality improvement through continuous examination of underlying work processes, and (3) an emphasis on empowering employees to identify opportunities that can improve quality (Dean and Bowen, 1994; Waldman, 1994; Hackman and Wageman, 1995; Shortell *et al.*, 1995; Zinn, Weech and Brannon, 1998). To put these principles into practice, the TQM literature also refers to a variety of activities or interventions. For example, the principle of an explicit focus on satisfying customers typically entails the collection and analysis of customer satisfaction data. A commitment to quality improvement usually involves the formation of cross-disciplinary teams to examine and improve work processes. An emphasis on empowering employees to identify quality improvement opportunities entails some type of employee training initiative in the use and application of statistical methods for process improvement (Dean and Bowen 1994; Hackman and Wageman, 1995; Westphal *et al.*, 1997). As noted by Shortell *et al.*, TQM differs significantly from traditional, hospital-based quality assurance practices because of "...[its] focus on understanding and improving underlying work processes and systems rather than correcting after-the-fact errors of individuals" 1995: 378).

TQM started becoming popular in the health care industry during the late 1980s (Garvin, 1988; Westphal, Gulati, and Shortell, 1997). During this period, VHA's Chief Medical Director strongly endorsed TQM to hospital directors. However, consistent with the approach taken by several large, private-sector health care companies,³ the Chief Medical Director declined to issue a systemwide mandate. Instead, he launched a voluntary campaign to encourage hospital directors to adopt TQM (Barbour *et al.*, 1996). For hospital directors, the decision to adopt TQM was an important one with significant strategic implications. On the one hand, TQM offered directors a potential opportunity for achieving cost-effective improvements in service quality. At this time VHA directors, like their private-sector counterparts, were beginning to face growing cost constraints and were in need of management practices

that could help them do more with less. Directors also would gain some goodwill with VHA headquarters for following a recommended practice. On the other hand, adoption also required directors to initiate activities or interventions that were counter to the traditional quality management practices of VHA. Such initiatives would undoubtedly be met with some degree of resistance from employees. Indeed, TQM initiatives would entail changes in a hospital's organizational structure (e.g., the appointment of a quality steering council for forming cross-disciplinary teams), human resource practices (e.g., ongoing training and education in statistical process control), and information systems (e.g., system for collecting and tracking satisfaction data from customers). In addition, directors faced the prospect of labor disputes since some of the unions that represent VHA employees had adopted the position that TQM affected existing management-labor agreements.

Prior to the present study, the prevalence and patterns of TQM adoption among VHA hospitals were not known. While a survey conducted by the American Hospital Association indicates that by the mid-1990s approximately 70 percent of private-sector, general hospitals had adopted some form of TQM (Barness *et al.*, 1993), no comparable data were available for VHA hospitals. Unlike several previously published studies, we did not attempt to assess the implementation of TQM or its actual impact on quality improvement (Westphal *et al.*, 1997; Shortell *et al.*, 1995; Parker *et al.*, 1999; Powell, 1995; U. S. GAO, 1991). Our study focused on TQM adoption as the critical event of interest.

THEORETICAL ISSUES AND HYPOTHESES

Both top manager and network/institutional schools of thought have emerged as important theoretical perspectives for studying patterns in the adoption of innovations among organizations (Drazin and Schoonhoven, 1996). Each perspective approaches the issue of adoption very differently, however. Below we discuss these two perspectives as a theoretical foundation for study hypotheses.

Top manager

The top manager perspective begins by recognizing that top managers are responsible for adopting the

³ Two such private-sector systems that at the time encouraged but did not mandate their respective hospitals to adopt TQM are Hospital Corporation of America (HCA) and the American Medical International (see Westphal *et al.*, 1997). By making TQM voluntary, VHA was also able to avoid some degree of union opposition to the initiative (Barbour *et al.*, 1996).

key policies that govern an organization's activities (Hambrick and Mason, 1984). As such, top managers are the individuals who have the decision-making authority to adopt innovative management practices. However, since the top managers of some organizations can be expected to have a higher propensity for innovations than do the top managers of other organizations, the top manager perspective focuses on identifying the personal characteristics of top managers that influence their relative propensity for innovations.

Hambrick and Mason (1984) were among the first researchers to propose the demographic characteristics of top managers as indicators of the managers' propensity to adopt innovations. The theoretical foundation of this research is that demographic characteristics are indicators of the background and experiences that shape a manager's cognitive base—those values, beliefs, and abilities that influence his/her decision making (Hambrick and Mason, 1984). From this perspective, demographic characteristics such as education and age can serve as proxy measures for individual cognition. Although some management scholars have raised concerns about whether demographic characteristics are a valid proxy for individual cognition (Markoczy, 1997), there exists a line of studies offering empirical support for this perspective (cf. Kimberly and Evanisko, 1981; Boeker, 1997a; Buchholtz and Ribbens, 1994; Hambrick, Geletkanycz and Fredrickson, 1993).

As noted, during the study period each VHA hospital had its own director. These directors had the authority to adopt TQM for their respective hospitals. Although virtually all of these directors had spent their entire professional careers with VHA,⁴ they did differ on a number of theoretically important demographic variables, namely, age, organizational tenure, education, and prior exposure to TQM. Below we advance hypotheses regarding the impact of these top manager characteristics on adoption of TQM among VHA hospitals.

It has long been suggested, although not well documented, that the age of top managers is negatively associated with their receptivity to change and innovation (Carlson and Karlsson, 1970; Vroom and Pahl, 1971). With advancing age,

managers may become less flexible from a cognitive standpoint in adapting to new ideas and practices. Older managers may also have much invested, emotionally and financially, in the organizational status quo and thus are unwilling to commit themselves to major organizational undertakings (Hambrick and Mason, 1984; Buchholtz and Ribbens, 1994). Thus:

Hypothesis 1: Within VHA, a hospital's likelihood of adopting TQM will be negatively associated with its director's age.

Organizational tenure raises conflicting points of view as to its impact on a top manager's attitude toward change and innovation. One point of view is that increasing tenure leads top managers to become stale and resistant to change (Boeker, 1997a; Buchholtz and Ribbens, 1994). Top managers with long tenure in their respective organizations are likely to have obligations to existing organizational constituencies that have vested interests in the status quo. The other point of view is that with increasing tenure top managers become better able to manage the organizational, political, and cultural challenges associated with the adoption of an innovation (Kimberly and Evanisko, 1981; Meyer and Goes, 1988; Arndt and Bigelow, 1995). As a result, managers are more willing to engage in change efforts and to adopt innovations. Although both points of view have theoretical merit, one of the most recent and carefully conducted studies addressing the issue supports the position that with increasing tenure managers become less willing to change (Boeker, 1997a). Thus:

Hypothesis 2: Within VHA, a hospital's likelihood of adopting TQM will be negatively associated with its director's tenure.

A top manager's education is another theoretically important demographic characteristic (Hambrick and Mason, 1984; Kimberly and Evanisko, 1981). In theory, highly educated individuals may engage in more boundary spanning and may possess greater ability to handle the complex information processing that change efforts entail. Several studies offer empirical support for this position (Kimberly and Evanisko, 1981; Rogers and Shoemaker, 1971).

In terms of the level of education among VHA hospital directors during the study period, two

⁴ Accordingly, the directors did not have sufficient professional experience outside VHA to consider it as a potential demographic characteristic for the study.

primary groups can be identified. One group consists of directors who worked their way up VHA's career ladder without the benefit of a graduate degree. The other group consists of directors who earned a graduate degree. Thus:

Hypothesis 3: Within VHA, a hospital's likelihood of adopting TQM will be positively associated with its director's possession of a graduate degree.

A manager's previous exposure to an innovation may also be an indicator of his/her propensity to adopt that innovation in the future. Thus, some management scholars view top manager migration within a social system as a diffusion mechanism for innovations (McKinney, Kaluzny and Zuckerman, 1991). Among VHA hospitals, substantial turnover of directors occurs due to reassignments and promotions. As noted by Granovetter "[w]hen a man changes jobs, he is not only moving from one network of ties to another, but also establishing a link between these" 1973: 1373). Boeker (1997b) recently reported results from a study where he found that when top managers migrate from one company to another, they influence their new company to adopt some of the strategies of their former company. Along this line of theory and empirical results, VHA hospital directors who have managed a hospital with an innovation, whether through their own decision to adopt or the decision of a previous director, may be inclined to adopt that innovation at other hospitals that they subsequently manage. Thus:

Hypothesis 4: Within VHA, a hospital's likelihood of adopting TQM will be positively associated with its director having had prior exposure to TQM at another VHA hospital.

Network/institutional perspective

The network/institutional perspective begins by recognizing that most organizations are embedded in multiple networks that can include, for example, sister subsidiaries as well as a parent company, competitors, suppliers, distributors, and regulatory bodies. As Scott has noted, "being embedded in a network of social relations can bring one news of innovations, support for adoption, helpful hints regarding implementation, and social support encouraging change" 1990: 184). Normative

pressures for conformity are a central theme in the network/institutional theory literature. Organizations are said to adopt management practices in many cases not for reasons of efficiency or effectiveness but because the practices eventually come to be taken for granted as the way things are done (DiMaggio and Powell, 1983; Meyer and Rowan, 1977; Judge and Zeithaml, 1992). Thus, according to the network/institutional perspective, as the number of adopters increases, so do the normative pressures on potential adopters to adopt the innovation.

As noted, VHA hospitals are embedded in networks both within and outside the VHA system. Through these networks, hospital directors are exposed to normative pressures to adopt innovative management practices such as TQM (Halverson, Kaluzny, and Young, 1997). Below we advance hypotheses regarding the impact of these network arrangements on adoption of TQM among VHA hospitals.

According to some theorists, potential adopters are mostly likely to be influenced by adopters to whom they are structurally equivalent, that is to whom they share a similar social role or social position within a network (Burt, 1987). Within VHA, which at one level is a national network of hospitals, a hospital director's social status has traditionally been based to a large degree on the service complexity of the hospital he/she manages. VHA hospitals can be sorted into three major categories of service complexity. Some hospitals offer a complete range of services including those requiring very advanced technology (e.g., cardiac bypass). Others offer a more limited line of basic services. There is also an intermediate group of VHA hospitals that offer all but the most technologically complex services (Wright *et al.*, 1996). These differences in hospital service complexity serve to stratify the hospital directors socially and professionally. In particular, VHA headquarters has used service complexity to form hospital peer groups for budgeting, resource management, and other administrative purposes (Stefos, LaVallee, and Holden, 1992). As a result, performance expectations for directors of hospitals within the same service complexity category have been much more similar than performance expectations among directors of hospitals in different service complexity categories. Moreover, a director's salary has been tied to the service complexity of the hospital he/she manages, with the highest

salaries going to directors who manage the most complex hospitals. From the perspective of the structural equivalence model, it can be expected that VHA hospital directors would be influenced by the adoption decisions of those directors who manage hospitals with comparable levels of service complexity as their own. Thus:

Hypothesis 5: Within VHA, a hospital's likelihood of adopting TQM will be positively associated with the cumulative number of previous adoptions among hospitals with a similar level of service complexity as its own.

Management theorists have also posited that potential adopters are likely to be influenced by adopters with whom they have established communication linkages (Coleman, Katz, and Menzel, 1966; Davis, 1991). According to the cohesion model, direct communication linkages provide potential adopters with ongoing information about the innovation that induces them to adopt. Within VHA, patient referral relationships are such a source of communication. Referral relationships have formed among VHA hospitals with different complements of services and technology. In these relationships, clinical and administrative personnel from each participating hospital will at least from time-to-time be in communication with their counterparts at other participating hospitals concerning referral protocols, treatment plans, and follow-up care. Consequently, hospital directors are exposed to ongoing information about the innovative policies and practices of their referral partners (Halverson *et al.*, 1997). Consistent with the cohesion model, these referral networks serve as conduits through which information about innovations is communicated. Theoretically, a greater number of adoptions within a patient referral network will translate into greater normative pressures for potential adopters to adopt a management innovation such as TQM. Thus:

Hypothesis 6: Within VHA, a hospital's likelihood of adopting TQM will be positively associated with the cumulative number of previous adoptions among hospitals with which it has a patient referral relationship.

Within networks where communication linkages exist, some adopters might have more influence on potential adopters than other adopters. Rogers

(1995) points out that under conditions of high visibility, the demonstration of an innovation can facilitate the innovation's diffusion, particularly among those potential adopters who can observe the demonstration through their usual interactions with the adopters participating in the demonstration. During the early 1990s, VHA headquarters selected twelve of its hospitals that were early adopters of TQM as demonstration sites for study and evaluation. Selected hospitals received training and consulting services that VHA headquarters arranged and paid for. Because these demonstrations involved the time and effort of senior VHA officials from headquarters, they had high visibility within VHA. Thus:

Hypothesis 7: Within VHA, a hospital's likelihood of adopting TQM will be positively associated with the previous adoption of TQM by a hospital within its patient referral network that served as a demonstration site.

In addition, research grounded in the network/institutional perspective suggests that potential adopters may be inclined to imitate adopters whose goals or activities they perceive to be more certain or legitimate than their own (Meyer and Rowan, 1977; Rowan 1982; DiMaggio and Powell, 1983; Fennel and Alexander, 1987). From this perspective, potential adopters focus on practices that can enhance their standing among the network members they respect or perceive to be successful. These so-called mimetic processes can be expected to apply to VHA hospital directors vis-à-vis the local health care delivery networks in which their hospitals are embedded. VHA hospitals are embedded in local health care delivery networks where the hospital directors are exposed to innovative ideas and practices of private-sector hospitals. There are several mechanisms through which this exposure may occur. For example, many VHA hospitals have contractual arrangements with private-sector hospitals in their community to obtain certain clinical or administrative services that they do not provide directly. In such arrangements the VHA hospital director will be in communication with his/her private-sector counterparts to discuss the details of the arrangements. VHA hospital directors also interact with their private-sector counterparts through various social gatherings, local civic events, and professional meetings (Halverson *et al.*, 1997).

VHA hospital directors are likely to be motivated to imitate the private-sector hospitals in their respective communities. VHA is a component of a federal agency that provides health care services in a country where most such services are provided by private-sector organizations. Accordingly, as a federal agency, VHA has long faced questions about its legitimacy. Indeed, VHA officials have often expressed frustration over what they believe is the media's tendency to sensationalize incidents of alleged malpractice at VHA hospitals (Barbour *et al.*, 1996). While criticisms about the quality of care in VHA hospitals are invariably based on anecdote rather than systematic research, such criticisms can be expected to motivate VHA hospital directors to search for ways to enhance their legitimacy in the eyes of their counterparts at private-sector hospitals. Thus:

Hypothesis 8: Within VHA, a hospital's likelihood of adopting TQM will be positively associated with the cumulative number of private-sector hospitals in its community that have adopted TQM.

Stage of diffusion as a moderating variable

Although the top manager and network/institutional perspectives offer distinct explanations for the adoption of innovations among organizations, they are not necessarily incompatible perspectives. Research by Tolbert and Zucker (1983) and others suggests that the adoption decisions of organizations are a function of both internal factors as well as external or social factors, but that the relative importance of these factors changes over time as an innovation diffuses among potential adopters (Rogers, 1995; Burns and Wholey, 1993; Westphal *et al.*, 1997). Specifically, during the initial stage of a diffusion process, adopters are those who see technical value in the innovation relative to their own internal needs. As the diffusion process progresses, the number of adopters increases, creating an opportunity for social-level factors to influence adoption decisions. Thus those who adopt at later stages of the diffusion process are likely to do so largely in response to growing normative pressures for adoption.

Applying these general principles to the diffusion of TQM in VHA, we would expect that the relative importance of top manager and network/institutional factors changed during the

course of the diffusion process. Given previous research indicating that early adopters are those who see technical value in an innovation, we would also expect that early adopters are likely to have a high propensity for change and innovations generally. The basis for this corollary is that the early phase of a diffusion process is marked by high uncertainty regarding the value and potential acceptance of the innovation (Rogers, 1995). Accordingly, within VHA, the early adopters of TQM were likely to have been hospitals with directors whose demographic profile suggests a high propensity for innovations. As the diffusion process progressed, those hospitals that adopted did so because their directors faced increasing normative pressures for adoption. Thus:

Hypothesis 9: During the initial phase of the diffusion period, top manager factors will be more important than network/institutional factors in explaining the adoption of TQM among VHA hospitals. In the later stages of the diffusion period, network/institutional factors will be more important than top manager factors in explaining the adoption of TQM among VHA hospitals.

METHODS

Our approach to testing study hypotheses was that of an event history analysis. This research approach has been widely used to study patterns of adoptive behavior in organizational settings (e.g., Burns and Wholey, 1993; Davis, 1991; Ginsberg and Buchholtz, 1990).

The study sample consisted of a panel of VHA hospitals. The panel initially consisted of the 171 hospitals that were in operation as of 1989. However, during the study period, 1989–1998, VHA consolidated some of its hospitals so that by the end of the study period the panel consisted of 150 hospitals. The unit of analysis was the hospital. We obtained data from both primary and secondary sources.

To determine whether and when VHA hospitals adopted TQM, we conducted a survey of hospital directors between September 1998 and February 1999. The questionnaire asked directors to indicate whether their hospital had adopted TQM. For purposes of the questionnaire, we defined TQM adoption as a decision by the hospital director

(whether the director responding to the survey or a predecessor) to put into practice each of the three previously discussed TQM principles: a focus on customer satisfaction, a commitment to continuous quality improvement, and an emphasis on empowering employees to identify opportunities to improve quality. The questionnaire instructed directors to indicate adoption only if their hospital had initiated for each TQM principle at least one related activity or intervention. If adoption reportedly had occurred, directors were asked to describe the activities or interventions that had been undertaken (e.g., customer satisfaction survey, employee training in statistical process control). Directors were also asked to indicate the date of adoption (i.e., month and year) based on when the decision to adopt was formally announced to hospital employees. To provide such a date, directors were instructed to refer to copies of memoranda that they or their predecessors had disseminated to employees announcing the adoption of TQM.⁵ In the case of consolidated hospitals, the questionnaire asked hospital directors to also indicate if and when any of the previously independent hospitals that they currently oversee had adopted TQM before the consolidation following the same criteria presented above. We conducted follow-up surveys with hospital directors who did not respond to the initial mailings and ultimately achieved a 100 percent response rate to the survey.

Our purpose in requiring directors to describe their hospital's TQM activities and interventions was to minimize reporting errors in terms of whether TQM adoption had occurred in accordance with the study's definition. After examining the data, we made follow-up telephone calls to several directors to clarify their responses to the questionnaire regarding the TQM activities they described and how they were connected to the corresponding TQM principles. In two cases, we concluded that the information provided did not

indicate TQM adoption as defined for the purpose of our study.⁶ Since, as noted, our focus was on the adoption of TQM and not its implementation, we did not attempt to collect data on the scope or effectiveness of any reported activities or interventions. The survey questionnaire also inquired about whether hospitals had abandoned TQM at some point following adoption. There were no reports of abandonment.

Definition and measurement of variables

Dependent variable

TQM adoption TQM adoption was a dichotomous variable (1 = adoption, 0 = no adoption). For each hospital we used the survey questionnaire data to determine whether and when TQM adoption had occurred. Since some lag typically existed between the time a hospital director made the decision to adopt TQM and notification of the decision to employees, adoption was specified as an event within three-month intervals throughout the study period. Thus, we assigned a code of one for each hospital at the three-month interval that covered the documented date of adoption.

Independent variables

Top manager factors We obtained data on the demographic characteristics of hospital directors from VHA internal personnel files for years 1988 through 1998. These files provided information for each hospital director including age, education, and hospital positions held since joining VHA. We used these personnel files to construct a data base identifying the relevant demographic characteristics of the director at each VHA hospital for each three-month interval during the study. Thus for a given hospital the values of the director's demographic characteristics would change in the first

⁵ Our preliminary research had revealed that such documentation would be available at all hospitals that had adopted TQM. Directors were also requested to forward to the research team copies of the documents to which they referred for establishing the date of adoption. All respondents reporting adoption were able to provide documentation establishing the date of adoption. In the survey questionnaire we also asked directors to indicate the time that elapsed between the announcement to employees of the adoption of TQM and the initiation of activities for all three TQM principles. Since all the respondents reported that elapsed time was less than 12 months, we decided that the date of the announcement provided a valid reference point for establishing the date of TQM adoption.

⁶ In an effort to verify the accuracy of the survey data, we conducted site visits to twenty of the participating hospitals. The directors of 15 of these selected hospitals had indicated that TQM adoption had occurred at their hospital. During each site visit we assessed the hospital's status of TQM by conducting interviews with hospital staff members (e.g., director, chief of staff, person responsible for quality management or related function) and reviewing relevant documents. We found that the site-visit data uniformly supported the survey responses. For the other five hospitals where TQM reportedly had not been adopted, we found no evidence of a discrepancy between the director's response to the survey and the actual state of affairs at the hospital (i.e., TQM had not been adopted).

three-month period following the departure of an existing director and the appointment of a new one. Age and organizational tenure were continuous variables and both were measured in years. Education was a dichotomous variable, whether or not the director held a graduate degree. To assess the effect of director transfers, we created a dummy variable that indicated whether at each three-month interval during the study period a hospital's director had prior TQM exposure before assuming the directorship at the focal hospital.

Hospital service complexity We used a VHA data base to classify hospitals into the service complexity categories discussed previously. Thus the high complexity category consisted of hospitals that provide a full set of acute-care services; the moderate complexity group consisted of hospitals that typically offer both medical and surgical care but do not have on-site technology to perform a full range of cardiac and transplant procedures; and the low complexity group consisted of hospitals that offer inpatient services for routine medical conditions but do not have in-house capacity to perform surgery.⁷ None of the hospitals changed their classification during the study period. For each hospital in the study, we computed the percentage of hospitals in its service complexity group that had adopted TQM at each three-month interval during the study.

Patient referral networks To assess the effect of patient referral networks, we constructed a unique referral network for each VHA hospital. We defined a hospital's primary referral network as (1) every VHA hospital from which the focal hospital received at least ten percent of the total referrals it received from other VHA hospitals over a 12-month period, and (2) every hospital to which the focal hospital sent at least ten percent of the total referrals it sent to other VHA hospitals over a 12-month period. We used a ten percent cut point because we found, based on frequency distributions, that after applying this criterion each VHA hospital typically had between two and four referral partners that accounted for over 90 percent of the referrals the focal hospital received from

or sent to other hospitals. To identify the source and destination of patient referrals, we referred to VHA's Patient Treatment File. This computerized data set contains for each patient admitted to a VHA hospital the dates of hospital admission and discharge. We used this data set to identify referrals from one VHA hospital to another. A patient referral was recorded where a patient was discharged from one VHA hospital and admitted to another VHA hospital on the same day. Although we reconstructed the primary referral networks for each year of the study period, the composition of the networks changed very little during the study period. For each hospital in the study, we computed the percentage of hospitals in its referral network that had adopted TQM at each three-month interval during the study.

TQM adoption at private-sector hospitals We obtained information about TQM adoption among private-sector hospitals from a survey conducted by the American Hospital Association (AHA). The AHA conducted surveys of U.S. hospitals in 1993 and 1998 to assess the prevalence and practice of TQM. The survey methods and response rates have been reported elsewhere (Westphal *et al.*, 1997). The information we used were annual survey estimates, by county, of the percentage of private hospitals that had adopted TQM beginning in 1989 through 1998. Since these adoption rates were available on an annual basis only rather than a three-month basis, we used linear interpolation to compute cumulative rates of adoption for each three-month period of the study. We then matched these data with the counties in which VHA hospitals were located to obtain an estimate of the percentage of private-sector hospitals within each VHA hospital's county that had adopted TQM for each three-month period during the study period.

Control variables

Size Many studies of adoptive behavior in organizational settings have considered the effect of an organization's size. Some studies suggest that size may be an indicator of bureaucracy and thus is likely to be negatively associated with change. Other studies suggest that size is a proxy for slack resources and may then be positively associated with change (Kimberly and Evanisko, 1981). Although hospital size was not of central concern to our study theoretically, in our analyses

⁷ The VHA data base actually classified hospitals into four groups based on service complexity. However, we collapsed two groups to form the moderate group since the differences between the two original groups were not relevant to the study.

we controlled for size as measured by the number of hospital employees. This information came from a VHA for data base that provides descriptive information for member hospitals on an annual basis. We assigned values for hospital size at each three-month interval, though the size (and particularly relative size) of VHA hospitals changed little during the study period.

Union opposition Some unions have sought to block organizations from adopting TQM (Jha, Michela and Noori, 1997). As mentioned, union opposition was an issue for many VHA hospitals (Barbour *et al.*, 1996) all of which have substantial numbers of their workforce in union bargaining positions. To assess union opposition to TQM at each VHA hospital, we asked directors (in the survey questionnaire) to indicate on a five-point scale the local union's stated opposition to TQM (1 = no opposition, 5 = high opposition). For directors whose tenure at the focal hospital was too recent to have a well-informed opinion on this matter, we requested that they talk with other senior managers at the hospital and use the information to provide a response on the five-point scale.

Statistical methods

For statistical analysis, we used Cox Proportional Hazards Model. This is available through SAS as

the PHREG procedure (Allison, 1995). We chose this model because it is capable of handling data sets that include, as is the case in our study, time dependent (e.g., top manager factors) and time independent covariates (e.g., union opposition). This statistical model is also appropriate for addressing the problem of censored data. Because we had complete data on TQM adoption rates from the first adoption in VHA until the end of the study period (i.e., December 1998), there was no problem of left censoring. Right censoring, however, did exist in two respects. First, not all of the VHA hospitals had adopted TQM by the end of the study period. Second, as noted, during the study period some VHA hospitals were consolidated. Since some of the consolidated hospitals had not adopted TQM at the time the consolidation occurred, they are also right censored observations. The Cox model has been shown to produce high-quality estimates even when a substantial number of observations are right censored (Davis, 1991). All independent variables were lagged by one time interval.

RESULTS

Figure 1 presents the number of TQM adoptions among VHA hospitals for each year in the study

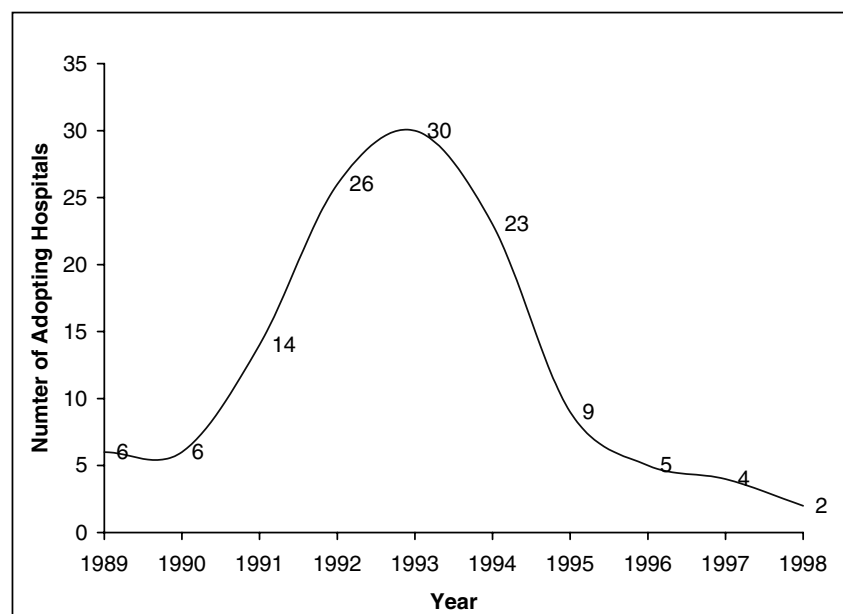


Figure 1. TQM Adoption Rates

period. As of the end of the study period, 125 VHA hospitals (approximately 83 percent of all the VHA hospitals that remained at the end of the study period) had adopted TQM. As Figure 1 indicates, the pattern of TQM diffusion in VHA approximated a normal distribution, or S-shaped curve when plotted cumulatively. This pattern is consistent with what has been observed in many other studies of the adoption of innovations settings (cf. Rogers, 1995; Burns and Wholey, 1993; Davis, 1991; Westphal *et al.*, 1997). The annual number of adoptions peaked at about the mid-point of the diffusion period and then declined steadily in each subsequent year.

Table 1 presents descriptive data on the characteristics of hospitals in the panel. Means and standard deviations are presented for the first and last year of the study period. Changes in the

distribution of hospitals among service complexity categories reflect the previously discussed hospital consolidations. Table 2 presents zero-order correlations among the independent variables based on pooled data across the study period. These correlations indicate that collinearity among the independent variables was not a problem for multivariate analyses.

Table 3 presents the first set of results from testing study hypotheses. We estimated the effects of each set of variables (i.e., controls, top manager factors, network/institutional factors, combined top manager and network/institutional factors) sequentially in separate models. Model 0 presents the effects of the control variables alone. Only hospital size was statistically significant: larger hospitals were more likely to adopt TQM. Model 1 added top manager factors for Hypotheses

Table 1. Descriptive characteristics of hospitals in panel at beginning and end of study period

	1989		1998	
	Mean	Standard deviation ¹	Mean	Standard deviation
Director age	51.6	7.5	54.4	7.1
Director tenure	7.8	5.6	6.9	4.8
% Directors with graduate degree	61.7		70.2	
% High complexity	35.45		37.89	
% Moderate complexity	48.06		49.24	
% Low complexity	16.49		12.87	
# Hospitals in patient referral networks	3.21	1.23	3.03	1.17
Hospital size (FTEs)	1089.6	633.3	987.5	612.4
Union opposition ² (5 point scale, 5 = most opposition)	2.64	1.25	2.64	1.25

¹ Reported for continuously measured variables only

² Variable is measured only once

Table 2. Correlation matrix for independent variables based on pooled 1989–1998 data

Variable	1	2	3	4	5	6	7	8	9
1. Age									
2. Tenure	0.04								
3. Graduate degree	−0.17	0.06							
4. Prior TQM exposure	0.15	0.21	0.03						
5. Cumulative adoptions—service complexity	0.00	−0.03	−0.05	0.06					
6. Cumulative adoptions—referral networks	−0.01	−0.02	0.08	0.01	0.04				
7. Demonstration—site status	−0.02	0.06	0.01	0.05	0.12	0.04			
8. Cumulative adoptions—private-sector hospitals	0.06	−0.04	0.09	−0.02	−0.02	0.01	−0.07		
9. Size	0.17	0.04	0.03	0.03	0.02	0.08	0.15	0.17	
10. Union opposition	−0.09	−0.02	0.10	−0.08	−0.03	0.03	0.11	−0.02	0.10

Table 3. Estimates of hospitals' adoption of TQM^{1,2,3}

	0	1	2	3
Controls				
Size	0.409* (0.186)	0.487** (0.185)	0.427** (0.139)	0.396* (0.161)
Union Opposition	-0.486 (0.398)	-0.395 (0.312)	-0.628 (0.545)	-0.320 (0.398)
Top Manager				
Age		-0.424* (0.214)		-0.536* (0.247)
Tenure		0.529 (0.687)		0.634 (0.479)
Graduate degree		0.789** (0.269)		0.509** (0.187)
Prior TQM exposure		1.239** (0.455)		1.120** (0.295)
Network/Institutional				
Cumulative adoptions— service complexity			0.987** (0.303)	0.877* (0.352)
Cumulative adoptions— referral network			0.661** (0.204)	0.664** (0.197)
Cumulative adoptions— private-sector hospitals			0.286 (0.244)	0.291 (0.246)
Improvement in χ^2	42.60**	136.21**	148.61**	189.42**

¹+ = $p < 0.10$ * = $p < 0.05$ ** = $p < 0.01$ ² Standard error in parentheses³n = 171 for beginning of time period

1 through 4. The results supported Hypothesis 1: TQM adoption was significantly and negatively associated with the age of the hospital's director. Study results did not support Hypothesis 2, which predicted that TQM adoption would be positively associated with the tenure of the hospital's director. Although the coefficient for the tenure variable was positive, it did not reach nor did it approach a level of statistical significance. Study results did support Hypotheses 3 and 4: TQM adoption was significantly and positively associated with both a hospital director's possession of a graduate degree and director's prior TQM exposure. In addition to examining linear relationships between top manager demographic characteristics and adoption, we also tested for other functional relationships (e.g., curvilinear relationship between age and adoption). However, none of the other functional relationships we tested proved to be statistically significant.

Model 2 presents network/institutional effects for Hypotheses 5, 6 and 8 (results for Hypothesis 7 are discussed below). The results supported Hypothesis 5: A hospital's adoption of

TQM was significantly and positively associated with the cumulative number of previous adopters that had a similar level of service complexity as its own. The results also supported Hypothesis 6, which pertains to cumulative adoptions in a hospital's patient referral network. A hospital's adoption of TQM was significantly and positively associated with the cumulative number of adoptions in its patient referral network. Study results did not support Hypothesis 8, which predicted that TQM adoption would be associated with the cumulative number of TQM adoptions among private-sector hospitals in the VHA hospital's local community.

Model 3 presents the results for the combined model of network and top manager factors. The same variables that were significant in either Model 1 or 2 were significant in Model 3. Model 3, however, had greater explanatory power than did either Model 1 or 2 alone ($p < 0.01$).

In Hypothesis 9, we predicted that the relative importance of top manager and network/institutional factors as determinants of TQM adoption will change during the diffusion period. To test this

hypothesis, we re-estimated Model 3 (presented in Table 3) with the data divided into the early and late stages of the diffusion process. We used the end of 1992 as the dividing point, since this was the point just before the annual number of adoptions peaked. A Chow test supported dividing the data set in this manner.

The results, which are presented in Table 4, provided general support for Hypothesis 9. In the early period, several top manager factors had a positive impact on adoption: age, possession of a graduate degree, and prior TQM exposure. None of the network/institutional factors had a statistically significant impact on adoption. However, a different pattern of results appeared in the late period. The only top manager factor that continued to be statistically significant was prior TQM exposure. With respect to the network/institutional factors, both cumulative adoptions within service complexity categories and cumulative adoptions within patient referral networks were significantly

Table 4. Estimates of hospitals' adoption of TQM by stage of diffusion Process^{1,2,3}

	Early Period (1989–1992)	Late Period (1993–1998)
Controls		
Size	0.420* (0.177)	0.399* (0.151)
Union opposition	–0.696+ (0.386)	–0.103 (0.097)
Top Manager		
Age	–0.733** (0.246)	–0.431 (0.388)
Tenure	0.589 (0.493)	0.617 (0.610)
Graduate degree	0.836** (0.244)	0.639 (0.544)
Prior TQM exposure	1.047** (0.388)	0.968* (0.401)
Network/Individual		
Cumulative adoptions— service complexity	0.449 (0.391)	0.736** (0.241)
Cumulative adoptions— referral network	0.388 (0.277)	0.771** (0.201)
Cumulative adoptions— private-sector hospitals	0.276 (0.253)	0.312 (0.289)
Improvement in χ^2	197.31**	189.61**

¹+ = $p < 0.10$

* = $p < 0.05$

** = $p < 0.01$

² Standard error in parentheses

³n (for beginning of time period)

for early period = 171; for late period = 117

Table 5. Estimate of impact of demonstration—site status on potential adopters^{1,2,3}

Controls	
Size	0.391* (0.179)
Union oppositions	–0.368 (0.379)
Top Manager	
Age	–0.543* (0.259)
Tenure	0.589 (0.499)
Graduate degree	0.549** (0.189)
Prior TQM exposure	1.018** (0.371)
Network/Institutional	
Cumulative adoptions— service complexity	0.928* (0.413)
Cumulative adoptions— referral networks	0.647** (0.207)
Previous adoption by demonstration site hospitals	0.407* (0.185)
Cumulative adoptions— private-sector hospitals	0.293 (0.218)
Improvement in χ^2	181.95**

¹+ = $p < 0.10$

* = $p < 0.05$

** = $p < 0.01$

² Standard error in parentheses

³n = 159 for beginning of time period

and positively associated with TQM adoption. As for the control variables, hospital size was statistically significant (and positive) in both periods while union opposition was marginally significant (and negative) in the early period only.

Table 5 presents results for Hypothesis 7, where we predicted that a hospital's likelihood of TQM adoption is influenced by the prior adoption of hospitals with demonstration-site status. To conduct this analysis, we first removed demonstration-site hospitals from the data base. We then included a dummy variable for each remaining hospital indicating for each three-month interval whether a hospital with demonstration-site status existed within its patient referral network. The coefficient for this variable was significant and positive supporting the hypothesized effect of demonstration-site hospitals on adoption.

DISCUSSION

Several key findings emerged from this study. A general finding is that while both top manager

and network/institutional factors are determinants of the adoption of innovations among organizations, their relative importance is moderated by the stage of the diffusion process. We found that top manager factors were more important than network/institutional factors for influencing TQM adoption during the early phase of the diffusion process, but that this changed as the diffusion process progressed. In the latter phase of the diffusion process, network/institutional factors assumed relatively greater importance than did top manager factors.

This general finding extends in two ways previous research on the adoption decisions of organizations. First, the finding demonstrates that top manager and network/institutional factors specifically underlie the sequence and timing of adoption decisions among organizations. Early adopters are not only those organizations whose top managers are among the first to see a technical fit between the innovation and the organization's needs, they are also organizations whose top managers appear to have demographic characteristics suggesting a high propensity for innovations generally. Those adopting in the latter stages of the diffusion process have top managers who are ostensibly reacting to normative pressures that take shape through the network arrangements in which their organizations are embedded. Thus one practical implication of our study is that in planning diffusion efforts, senior officials in the private- and public-sectors should target innovations initially to organizations whose top managers, based on their demographic characteristics, appear to have a high propensity for innovations generally. After some number of adoptions has occurred, steps can then be taken to leverage network arrangements to further diffuse the innovation among other organizations.

Second, the finding extends the generalizability of previous research by examining patterns of adoption in a public-sector agency. Previous studies have focused largely on industry settings with study samples consisting of firms that compete for resources in private-sector markets. By contrast, our study sample consisted of hospitals that operate within the same public agency. These hospitals secure resources largely through political and bureaucratic mechanisms rather than market ones and also have a broader service mission than do most private-sector organizations.

Yet, we found the pattern by which these public-sector organizations adopt a management innovation to be comparable to that of private-sector firms. Accordingly, our study demonstrates the robustness of the study's two theoretical perspectives for explaining the diffusion of innovations across different organizational settings. Although for most top managers the adoption of an innovation is an important strategic decision, it appears that a top managers' personal characteristics and the social pressures they face to adopt affect them similarly regardless of whether they are located within private- or public-sector settings.

Specific findings from the study also both confirm earlier research and offer potentially new insights into the adoptive behavior of organizations. With respect to the top manager perspective, our results are consistent with earlier research showing that younger and better educated top managers are more inclined to engage in change initiatives and adopt innovations. Younger managers may have less of an emotional commitment to a particular way of managing and thus are more receptive to new ideas. Better educated managers may be more skilled in identifying innovations from the stream of ideas to which managers are exposed. The fact that we did not observe a significant effect for tenure further extends the conflicting empirical research addressing this demographic variable. The role of tenure as it relates to change and innovation may be highly context specific. In a recent paper, Markoczy (1997) presents evidence that calls into question the validity of demographic variables as proxies for the cognitive orientation of managers. Certainly, our own results suggest that some demographic variables are likely to be better proxies than others and that additional research can help to differentiate between those demographic variables that are and those that are not good proxies.

Our results also support the proposition that innovations spread through top manager migration. Study results suggest that directors who had prior exposure to TQM were inclined to adopt this innovation at hospitals to which they were transferred. Thus they functioned as "bumble bees" cross fertilizing VHA with TQM. While earlier research has demonstrated such bumble bee effects for top manager migration among firms in an industry (Boeker, 1997b), we found that similar effects occur through manager transfers within multi-unit agencies or companies.

Our findings concerning director transfers also serve to draw an important distinction between the adoption and implementation of an innovation. Barbour *et al.* (1996) in his account of VHA's experience with TQM observed that director transfers often impeded successful implementation efforts due to a lack of sustained leadership commitment to an implementation approach. For multi-unit organizations seeking to diffuse an innovation, manager transfers may be a double edged sword; on the one hand, a mechanism that can facilitate the diffusion of an innovation among operating units, on the other hand a mechanism that can impede the implementation of an innovation following adoption at a particular unit.

Focusing on the network/institutional perspective, study results are consistent with earlier studies showing that normative pressures are an important force underlying the adoption of innovations. Consistent with the structural equivalence model, we found that an important social cue for hospital directors in deciding whether to adopt TQM was the prevalence of prior adopters with levels of service complexity comparable to their own hospital. Our results also indicate, as the cohesion model suggests, that the existence of direct communication linkages between adopters and potential adopters promotes adoption. Specifically, in deciding whether to adopt TQM, hospital directors appeared to be influenced by the prevalence of prior adopters in their patient referral network. Aside from the sheer prevalence of adopters, the attributes of adopters themselves appear important. We found that adopters with high visibility, based on their status as demonstration sites, were particularly influential in promoting subsequent adoptions.

Contrary to our prediction, the adoption decisions of VHA hospitals appeared unrelated to the prevalence of adoptions among private-sector hospitals within their local health care delivery networks. The adoption decisions of private-sector hospitals theoretically create a mimetic influence on public hospitals. The absence of such a finding suggests that mimetic pressures may in some cases be subordinate to other normative pressures that organizations face. D'Aunno, Sutton and Price (1991) note that in some organizational settings multiple belief systems may compete for adopters while in other settings one belief system is clearly dominant. Although VHA directors are exposed to the beliefs and values of their private-sector

counterparts, they may largely ignore or greatly discount these beliefs when they come into conflict with the beliefs of their VHA counterparts. A resource dependency perspective might predict such a result since these hospital directors rely on the VHA system for resources and their own professional advancement. It is also possible that because private-sector hospitals experienced substantial financial and political turmoil during the study period (e.g., Medicare spending cuts, Clinton health reform proposal), they lacked the necessary legitimacy to influence the actions of VHA hospitals. Of course, this finding may also reflect imprecision in the empirical analysis. In particular, our selection of county to define a VHA hospital's local health care delivery network may in some cases have been either too broad or too narrow a geographic area for estimating institutional pressures on VHA hospitals from private-sector adoptions.

Two general limitations of the study should be noted. First, although the study itself supports the generalizability of previous research on the adoption of innovations among organizations, more research is certainly needed to fully understand the boundaries of this line of inquiry. We focused on the adoption of one innovation among organizations within a public-sector agency. Accordingly, researchers should attempt to replicate study findings for samples of organizations operating in other private and public-sector systems. For example, investigators might consider the adoption of innovations within multi-divisional companies that span different cultural and economic settings. Second, we lacked information on the experiences that adopters have had with TQM. Since adopters' actual experiences with innovations are obviously a potentially important factor influencing potential adopters, future studies should attempt to build this information into their empirical models of adoption.

Finally, we refer back to the additional explanatory power that we gained by combining top manager and network/institutional perspectives to examine the adoptive behavior of VHA hospitals. Combining the two perspectives appears to offer a much more complete understanding of adoptive behavior than does either perspective alone. The results of the present study will hopefully motivate other researchers to explore additional perspectives for understanding the adoption and diffusion of innovations among organizations.

ACKNOWLEDGEMENT

Financial support for this paper comes from the Department of Veterans Affairs and National Science Foundation.

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