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INFORMATING THE CLAN: CONTROLLING PHYSICIANS' COSTS AND OUTCOMES^{1, 2}

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Abstract

Past literature recognizes the power of information technology (IT) to establish greater transparency and in turn the potential for greater control. Theoretical perspectives such as informing and agency theory describe situations whereby legitimized management authority can control goal divergence by implementing information systems

to better monitor agents' behavior and outcomes. But what happens when the principal does not possess legitimacy to impose an agent's use of information and/or behavioral conformance? This study investigates this situation. Through an action research project, a physicians' profiling system (PPS) was used to monitor and benchmark physicians' clinical practices and outcomes resulting in changed practice behaviors in closer congruence with management's goals.

The PPS project represents a successful attempt of a hospital's management (principal) to "informate the clan" of physicians (agents) to reduce clinical procedural costs and adopt practices benchmarked to produce better outcomes. This research moves beyond directly controlling informed workers through legitimized managerial authority to a better understanding of how to informate autonomous professionals. Emerging insights suggest that a clan can be informed if the principal can improve the perceived legitimacy of the information (the message), legitimize the technical messenger (customized user interface), legitimize the human messenger (boundary spanners and influential clan members), and facilitate an environment where clan-based discussion, using the information provided by the principal, is incorporated into the process of concertive control.

¹R. Baskerville was the accepting senior editor for this paper.

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Introduction

Control has long been a centerpiece concept in management literature (Eisenhardt 1985; Govindarajan and Fisher 1990; Ouchi 1979; Thompson 1967). Control typically is viewed through the formal and informal performance evaluation processes by which behaviors and outcomes are measured, evaluated, and rewarded. Control theories have been the basis for research in information systems (IS), including changes in behavioral rules and procedure of control (Orlikowski 1991; Sia and Neo 1997), the role of self managed teams and clan-like mechanisms (Henderson and Lee 1992; Klein and Kraft 1994), and self monitoring in controlling IS development projects (Kirsch 1996, 1997). Theories of control, including bureaucratic, economic, clan, and self-control, all see information availability and accuracy concerning behaviors and outcomes as key factors in shaping the structure of an organization's control systems. Information systems play a central role in making behaviors and outcomes more transparent between parties. In her classic work *In the Age of the Smart Machine: The Future of Work and Power*, Shoshanna Zuboff (1988) characterized this phenomenon as *informating*. She states that information technology (IT) not only automates,

but simultaneously generates information about the underlying productive and administrative processes through which an organization accomplishes its work. It provides a deeper level of transparency to activities that had been either partially or completely opaque....Activities, events and objects are translated into and made visible by information when a technology infomates (pp. 9-10).

While the above-mentioned studies (and many others in this line of inquiry) offer a valuable cumulative tradition concerning the use of IS in situations where the controller has legitimate authority over the controlled, they do not directly address the situation where the controller, attempting to informate workers' behaviors, does not possess such legitimacy. This paper addresses such a

problem situation. Specifically, this study tracks a hospital's attempts to exercise cost and outcome control over physicians via an information system by informing physicians' practice decisions with performance information. An initial direct informing attempt by management was viewed as a failure because, while it resulted in greater transparency, it failed to result in significant behavioral change in the clinical practice of the physicians. It was recognized that lack of management (principal) legitimacy strongly moderated expected control benefits over the physician (agents). A second, indirect, intervention focused on extending the informing concept to better fit the context of a clan of physicians. According to Ouchi (1979, p. 838), a clan forms when society demands a good or service that is difficult to control through explicit rules of bureaucracy or price mechanisms of markets. Under these conditions, members of a clan rely on control from

a deep level of common agreement between members on what constitutes proper behavior, and it requires a high level of commitment on the part of the each individual to those socially prescribed behaviors (Ouchi 1979, p. 838).

In clans, performance evaluation takes place through subtle reading of signals, ceremony, or ritual, that is possible among clan members "but cannot be translated into explicit, verifiable measures" (Ouchi 1980, p. 137). The second intervention, extending the informing concept to the clan, was recognized as a success, resulting in cost reduction and improvement in clinical outcomes. As was witnessed in this study, a clear advantage of action research is the opportunity to improve the system and its implementation as lessons are learned (Kaplan and Maxwell 1994).

The remainder of the paper is organized as follows: After the introduction of the problem situation in which the hospital faces financial challenges to reduce costs and a description of the action research methodology, *Intervention 1* is introduced, where the hospital's management attempts to employ a decision support system (DSS) to directly informate the hospital's physi-

cians. Intervention 1's learning highlights shortcomings in the principal-agent relationship implicit in direct attempts to informate when the principal lacks legitimacy. A second initiative, *Intervention 2*, is then undertaken by the management to mitigate its perceived lack of legitimacy by improving the recognized legitimacy of the information itself, by employing boundary spanning messengers, customizing user interfaces, and facilitating clan member discussion. This second intervention leads to the clan members' use of the provided performance benchmarking information in the physician group's concertive control processes and produces desired clinical practice changes. Finally, contributions are discussed followed by implications for research and practice.

The Problem Situation

St. John's Health System (SJHS) is an acute care community hospital in the Midwest region of the United States. During the 1980s, the costs of treating patients at SJHS continued to rise as the reimbursement for services changed from fee-for-service to capitation in which the insurance companies placed a cap on the amount of reimbursement. With the insurance companies shifting the risk of large cost increases on to the hospitals, SJHS felt threatened that its financial standing was at risk.

To exercise better control over its financial operations, SJHS needed to understand the service cost drivers.³ Given that physicians drive as much as 80 percent of hospital costs (Chilingerian and Sherman 1990) and determine the quality of patient outcomes, the examination of physician practice patterns was a logical place to begin. Like many hospitals in the early 1990s (see Bloomfield and Coombs 1992; Covalleski et al. 1993), SJHS desired to build and implement information

systems that better tracked physician-driven cost and quality outcomes to address these increasing institutional pressures. However, information systems in place at SJHS were not designed to track physician performance, nor was there a benchmark to compare such performance. Pressures from escalating costs grew to such a point that in 1991 the chief executive officer (CEO) summoned his senior administrative staff and top IT professionals to devise a solution. This action started a 10-year journey at SJHS to enact physician performance monitoring and behavioral change, which, over the course of this project, involved adjustments in theoretical understanding of IT's informing role and implementation schemes, as well as fundamental adjustments in the relationship between the hospital and its affiliated physicians. This paper chronicles this action research project, its failures and successes, its learning, and its theoretical contributions to better understanding the role of information systems in controlling professional agents when a principal lacks legitimacy.

Research Approach

Action research is an interventionist approach to the acquisition of knowledge that has its foundation in the post-positivist tradition (Baskerville and Wood-Harper 1996). Action research assumes that

a complex social process is best studied by introducing changes into that process and observing their effects. The theory underlying the interventions is validated by the extent to which these changes successfully solve problems in the setting (Baskerville and Stage 1996, p. 492).

Given that over time actors adapt and modify themselves, the technology and the evaluation process (Kaplan and Shaw 2002; May et al. 2000), action research has emerged as an approach for understanding hospital-physician interactions. Action research is also signified by the evaluation and control criteria for the project as well as the manner in which the researcher(s) interact and

³Per the directives of Healthcare Financial Administration, the reimbursing arm of the U.S. government, a hospital's reduction in costs while maintaining high quality of care was rewarded by an increased percentage in reimbursement as well as national recognition.

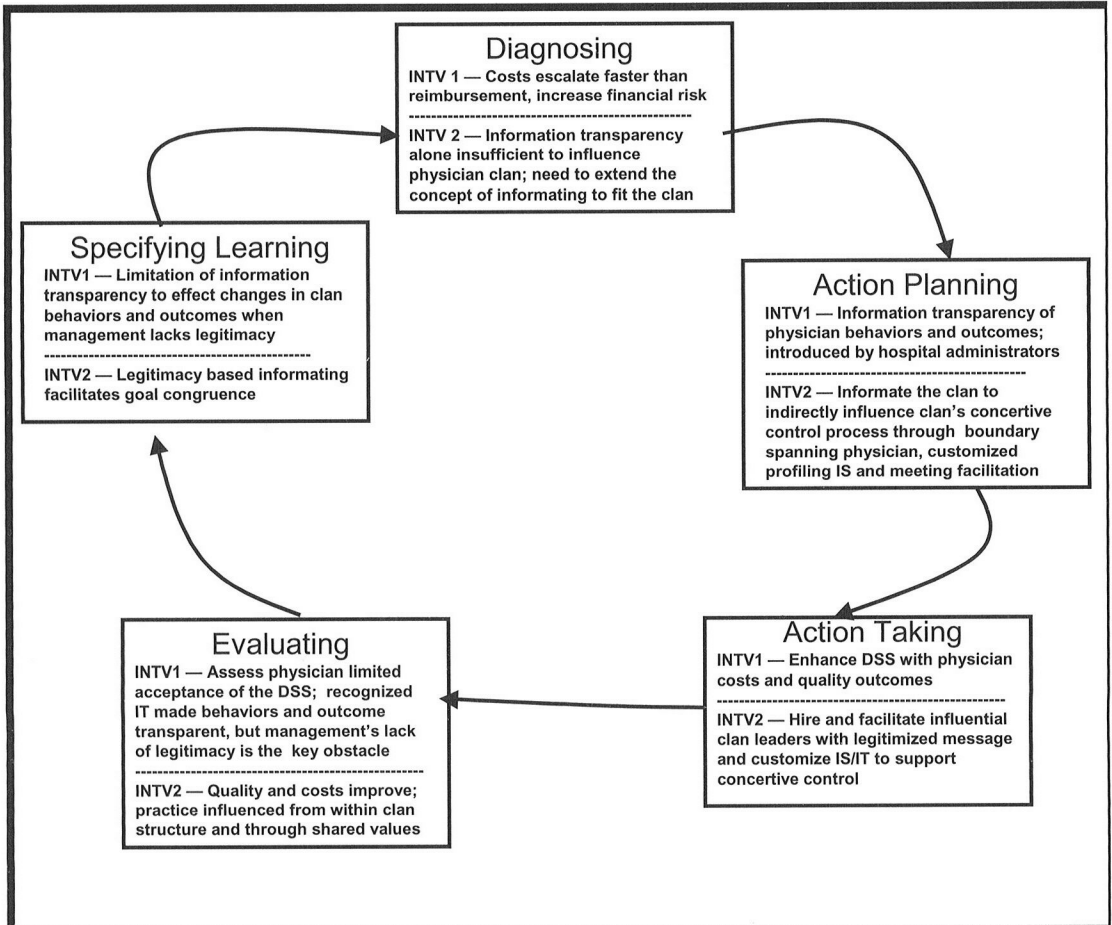


Figure 1. The Action Research Cycle (based on Baskerville 2001; Susman and Evered 1978). The figure is populated with steps encountered in two interventions of this research (indicated as INTV1 and INTV2).

respond to the expectations of the clients. The evaluation criterion for this study incorporate action research characteristics outlined by Baskerville (1999a) and Susman and Evered (1978). Appendix A demonstrates how this study met these criteria.

This study's interventions follow the action research cycle (ARC) steps proposed by Susman and Evered (1978): (1) diagnosing, (2) action planning, (3) action taking, (4) evaluating, and (5) specifying learning. Figure 1 highlights the ARC steps for the two interventions. Table 1 provides a timeline for the study's interventions. For

example, in Intervention 1, escalating costs were diagnosed as the problem and an action was planned. Consistent with the transparency tenets proposed by Zuboff's informing as well as the agency theory, an intervention was taken to directly introduce a DSS to the physicians so that their behaviors and outcomes were more transparent to the hospital management. The management hoped that such transparency could more directly influence physicians to cut costs. Evaluation of Intervention 1 indicated that while the DSS did make physicians' behaviors and outcomes more transparent, few physicians modified their practice behaviors. Intervention 1's learning led to

Table 1. Timeline of the Project's Interventions and IS Components

Stage	Time Period	Functionality	Technology Characteristics	Motivation
<i>Intervention 1: Informing, Transparency and Agency Theory</i>	1991-1995	Cost information system Severity adjustment	DSS and data warehouse design, on mainframe computers Reports prepared by IS staff based on users requests	Management uses IT to make physician cost and outcome behaviors more transparent in hopes of directly influencing cost reductions; similar to past success in controlling nurses' and technicians' behaviors Managerially led scheme; directed by hospital senior managers, IS, and administrators; bolstered by a perceived sense of legitimacy; spawned by institutional pressures to cut physician driven cost
<i>Intervention 2: Legitimize Informing Within Clan-Based Concertive Control</i>	1996-2001	<i>Design:</i> Individual physician report cards benchmarked against peers <i>Implementation:</i> User generated profiles with pre-built queries and templates for comparisons Facilitate easy peer-to-peer use and communication without IS intervention	Profiling system and data warehouse design, on dedicated servers Web-based and user customizable physician profiling system (PPS)	Project had failed; needed new approach Managerially indirect scheme; implementation approach modified so that clan members would introduce performance information into the clan's concertive control process to facilitate discourse, leading to clinical practice changes in closer goal congruence with the hospital's management Hospital hires a physician (clan member) as PPS advocate; legitimacy possessing boundary spanner appealed to physicians with easy-to-use and personalized profiles that are deemed as a valid reflection of their performance

Intervention 2, in which the action researchers diagnosed a need to extend the concept of informing into the context of a clan. Management undertook actions to indirectly introduce performance information into the clan's own concertive control process. For example, SJHS engaged a physician leader as a boundary spanner to help introduce a new physician profiling system (PPS). In essence conceding their own lack of management legitimacy, SJHS sought to elevate the perceived legitimacy of information provided by them in the eyes of the physicians. The evaluation and learning via the steps of the ARC process in the two interventions forms the basis for discussion in the next two sections.

Intervention 1

Intervention 1: Diagnosing

The first step in the Susman and Evered (1978) action research cycle—diagnosing—involves identifying or defining the problem. Typical of most acute care community hospitals, SJHS, as the principal, assigns the responsibility to physicians, as their agents, to dispense care to the patients. Physicians conduct clinical procedures, prescribe, and direct the nursing and ancillary clinical staff (radiology, pharmacy, laboratory, etc.) concerning patient care. In this way, cost is largely driven by the actions of physicians. SJHS delegates work to the physicians based upon their expertise by contracting clinical and surgical services with physicians and/or physician groups. These contracts are typically structured as hospital privileges, meaning that a physician has the right to practice medicine within a hospital based on the norms and rules set forth by a peer-regulated committee within a physician's practice area. Within this framework of hospital privileges, the physician is expected to offer quality patient care based on his/her professional norms of practice. For their services, the physicians either bill directly or get paid by the hospital based upon preset fee schedules; SJHS in turn bills for the total amount of cost incurred to the patients' insurance company. In either case, the dilemma faced by the

hospital managers is that while they are bound by outside institutional forces to contain hospital costs, they do not have strong direct control over the primary agent (physician) driving cost and quality of patient care.

In 1991, the chief financial officer (CFO) of SJHS complained that the hospital was being reimbursed for its services through a predetermined formula instead of the costs incurred in treating patients. Furthermore, insurers were factoring the quality outcomes (length-of-stay, complications, and patient satisfaction) into the amount of reimbursement when renewing contracts. Thus, the hospital bore the risk of patient care costs and, since physicians' compensation was based upon preset fee schedules outside the control of the hospital, the CFO had little ability to alter compensation schemes to push the risk to the physicians. Also, accounting data showed a significant variation in hospital costs for the same procedures performed by different physicians within the same specialty. The CFO believed that an initiative that motivated physicians to reduce such variation toward lower cost and higher quality of procedures was needed. The CFO commented:

Its physicians' practice-driven costs that we need to get a handle on. We do not have comparative benchmarking information to make them aware of cost and quality improvement opportunities. In essence, we let them regulate themselves.⁴

During the 1980s, the CFO's office had made strides in exploiting IT to control costs incurred by nurses' and technicians' discretionary clinical behaviors. Specifically, the hospital implemented the productivity tracking system (PTS). The PTS

⁴Quotes and scenarios were gathered from a variety of sources including memos, meeting minutes, IS service requests, shorthand notes taken on paper, and notes taken on a laptop during conversations with the actors, some of whom reproduced their conversations with other actors. We have attempted to place the quotes at appropriate locations in the article to indicate the timeframe and the source (e.g., CFO, CIO, project leaders).

was developed to track and standardize nursing and technical staff activities in providing care and had been very successful in calculating procedure-level costs. The implementation of PTS resulted in a significant reduction in variance among clinical activities. The PTS was a component of a larger clinical quality control information system that monitored clinical test orders and online results reporting. This system enabled computer-based monitoring of nursing and technical staff behaviors and, through benchmarking, training, and alteration in compensation schemes, resulted in cost savings. However, relative to the costs driven by the physicians, the overall cost savings resulting from PTS represented a relatively small portion of the hospital's total clinical costs. The CFO voiced his frustration to the director of continuous quality improvement and IT managers, including the manager of decision support systems in commenting:

If we could build a performance monitoring system similar to the PTS detailing [physicians'] costs and outcomes, and provide this information to the physician [practice area] committee, we might be able to set the right combination of pressure and cooperation to get them to make changes.

Similar to SJHS' experience with its PTS, other hospitals facing such problem situations have demonstrated management's enthusiasm to use performance monitoring information systems to contain rising health care costs. For example, Sia et al. (2002) report an implementation of an enterprise requirements planning system that gave a hospital "panoptic visibility," making nurses' and technicians' behaviors more transparent and strengthening processes of self, as well as, direct managerial control. In the case of performance monitoring of physicians, Bloomfield and Coombs (1992, p. 479) state hospital administrators pursuing a "resource management focus are very sensitive to the fact that the system will be, and is, seen as a new form of control over doctors."

In addition to defining the problem situation (as stated above) the *diagnosis* step of action

research involves a search for theoretical assumptions to understand an organization's phenomenon or behavior (Baskerville 1999b, p. 15). Established theories can place the problem situation into a structure and guide the researcher to a successful conclusion of the project. While many bodies of knowledge, such as technology adoption, diffusion, or resistance, apply to such problems, the study was particularly drawn to control and agency theory because the physician context went beyond the technology acceptance to the use of *legitimized* information they themselves deemed useful enough to affect practice changes and power relationships (Jasperson et al. 2003). Heavily dependent upon the influence brought to bear during the concertive control process, this social influence phenomenon is not fully captured by technology adoption, diffusion of innovation, or IT resistance literature.

In 1991, at the time of the initiation of this action research project, the concept of informed induced transparency (Zuboff 1988) represented a popular managerial perspective in understanding the impact that increased information availability brings to control,⁵ while agency theory held particular prominence in academic circles. Specifically, the three primary assumptions of agency theory seemed to have particular relevance to the problem situation: (1) there existed a goal divergence between the principal and agents, (2) there existed information asymmetry between the principal and agents making it difficult for the principal to observe agents' actions, and (3) the principal's and agents' risk preferences differed, which could lead to different consequences (Eisenhardt 1989, p. 60). Agency theorists claim two broad ways in which principals can improve efficiency of contract compliance between principals and agents: by designing information systems to monitor agent behavior or by tracking their actual performance (Eisenhardt 1985, 1989; Ouchi 1979, 1980). Similar to agency theory's tenets, Zuboff's (1988)

⁵Zuboff (1988) observes that informing will improve performance and the quality of work life, when employees are obligated, and accept, the use of feedback from IT based monitoring systems to change their work behavior.

informing framework suggested the need for management to be active in recognizing IT's potential to generate information about the underlying productive and administrative processes that were previously opaque. Zuboff documents how the explicit information content of tasks, gathered from monitoring agent behavior and/or outcomes, sets in motion a series of dynamics that will ultimately (re)configure the nature of work and social relationships that organize productive activity in line with the principal's objectives.

In traditional agency theory, as in Zuboff's informing framework, the power of the principal is implicit to exercise direct influence and enforce efficient contracts to limit the presumed self-serving behavior of agents. Although contractually bound to offer a high level of patient care, physicians have considerable power by virtue of their expertise. As was the case at SJHS, Kirsch (1996) suggests that managers who lack perceived legitimacy⁶ based on limited expertise of a service transformation process often seek information systems that provide behavioral and outcome observability. It is presumed that with access to this performance information, principals will better understand the process over time and will be more likely to use IS-based controls on the agent, seemingly feeling more confident in their legitimacy to understand and directly control an agent's work. Henderson and Lee (1992) as well as Kirsch (1996, 1997) found that as managers gain knowledge of the transformation processes they are more reticent to incorporate a control structure that combines existing workgroup controls with managerial agency-like controls. In a similar way, Covalski et al. (1993, p. 65) state that implementing physician clinical behavior accounting/monitoring systems represent conformity with new institutional rules and expectations being placed on hospital management by government and insurers, and helps explain new claims of management legitimacy in asking for,

⁶Legitimacy can be defined as a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of values, beliefs, and norms (Suchman 1995).

and using, this performance data to control physician-driven costs. Given a newly perceived sense of managerial legitimacy, given rising institutional pressures to control costs and their favorable experience with PTS implementation in cutting nursing- and technician-driven costs, SJHS management was keen to replicate similar benefits by establishing greater information transparency of physicians' work practices. While acknowledging past limits of their influence, management viewed this as a new opportunity to "bring the physicians' costs and outcomes to light" and, in doing so, more directly persuade the physicians to make clinical behavioral changes in line with the institutional realities that the hospital was facing.

Intervention 1: Action Planning

Action planning involves collaboration between the researcher and practitioners to consider alternatives to remedy the problem. The alternatives are generated and guided by theory indicating a desired future state as well as the means of change that would achieve such a state (Baskerville 1999b, p. 15). Theoretical selection was motivated by management's agency theory-like success in capturing and exploiting performance monitoring of the nurses and technicians with the PTS. It was hoped that once physician-monitoring data were captured by management and directed to physicians, management would gain greater direct influence by appealing to the physicians' resource management rationality for cost savings. Reporting directly to the CFO, the IT managers saw the situation as a call to arms and began planning to enhance the existing DSS to collect and process physician benchmarking information. Based on their experience with the PTS and other cost control and performance monitoring systems at SJHS, they knew that much of the raw data necessary to highlight physician behavioral performance were being collected and could be utilized. Their hope was that if they could design a clinical DSS to make these behaviors and outcomes transparent (as indicated in Figure 2), the control benefits promised by agency theory could be replicated in the context of the physicians.

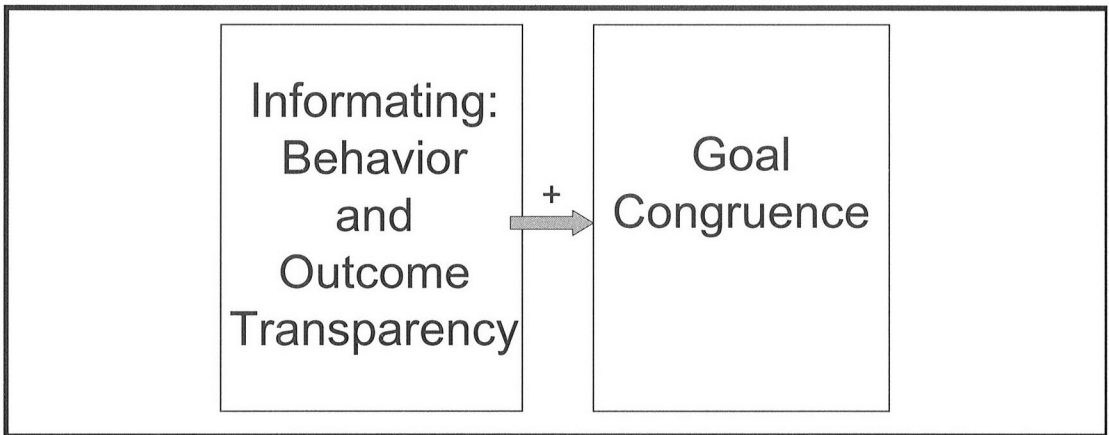


Figure 2. Intervention 1 Approach

Proposition A: *Greater information transparency through the use of a performance monitoring information system (providing valid measures of behaviors and outcomes) will lead to greater goal congruence between the principal (hospital) and the agents (physicians).*

The CFO, quality director, and DSS manager questioned how best to design an implementation process that could influence physician behavior and communicate the financial and quality implications of physician's clinical actions. Given the fact that none of the hospital managers were physicians and that they lacked entrée within the numerous physicians' committees⁷ that decided

clinical practice, it was deemed best to use the existing bureaucratic structure under management's direct control. Specifically, the CFO and the IT managers agreed that clinical administrative directors (hospital employees reporting directly to management) who worked closely with functionally related physicians in daily administrative activities were best suited to introduce the new performance monitoring system to the physicians as well as broach the topic of improvement in physician quality and cost reduction. Supporting this position, the CFO stated:

⁷As is typical of most hospitals, SJHS operates on a dual-track clinical-organizational structure. The non-physician structure, under the control of professional administrators, operates as a functional hierarchy. For example, the Emergency Care Unit is headed by a clinical department director that is paid by, and responsible to, the hospital's (principal's) chain of command. These hospital managers oversee the administrative and clinical technical staffs working within their units and coordinate with the affiliated physicians that practice within each functional area. A second, less formal and flatter, organizational structure is the professionally based physician committee structure that leverages peer-based control over credentialed physicians affiliated with a hospital. Physician committees, with practice areas such as Cardiology, or special purpose committees such as the performance improvement committee (PIC), are formed as a result of the medical com-

mittee bylaws, approved by the hospital board. Fellow physicians choose the chair of these committees. These physician peer groups generally meet fortnightly to approve colleague appointments, monitor the specialty, and discuss new treatment protocols and quality issues. When they discuss clinical quality, they typically request supporting data from the hospital's quality control and IS groups to compare their performance. The privacy of the committees' minutes is protected by federal law and is not publicly disclosed. Generally, the physician committees act informally, except when there is an accreditation, regulatory, or mandated issue requiring more formal proceedings. Coordination between the hospital's clinical department director (administrator non-physician) and the practice-related physicians typically occurs in a portion of these meetings after which the non-physician hospital administrator leaves and the physicians continue with the clinical issues agenda. SJHS had several such committees including a performance improvement committee and a credentialing committee.

Of all our [under direct control of management] hospital employees, clinical administrative directors are held in the greatest trust by physicians and are in a position to implement clinical process changes when deemed acceptable by the physicians

An open appeal would be made by a department's clinical administrative director at each physician group committee meeting stating the hospitals' urgent need to cut costs and how the functionality of the new clinical DSS would allow the physicians to benchmark their performance and compare themselves with their colleagues' best practices in terms of cost and patients' outcomes such as length of stay (LOS) and satisfaction. The hospital's managers expected that once the information was transparent to the group, the physicians would begin to use the data to examine their practice and ultimately adopt quality improvement and/or cost cutting clinical procedures, since the "benefits of these improvements were obvious to all."

The second prong of the hospital's Intervention 1 strategy was a superior service approach—"If we build it and offer responsive service, they will come"—whereby the hospital would actively demonstrate they wanted to provide "the very best data" to physicians. High levels of IT support would be provided to all early DSS adopting physicians through hospital-provided DSS analysts delivering highly customized reports and performance benchmarks. The hospital's CEO and CFO strategized that with limited effort invested and high quality data provided, physicians would begin to alter their practice behaviors.

Intervention 1: Action Taking

Action taking is the implementation of the planned action. Baskerville (1999b, p. 16) suggests that action taking can occur in a number of ways including the recruitment of laypersons as catalysts. In this study, three individuals with past experience with the PTS, including one of the action researchers, were assigned to develop the new capabilities of the clinical DSS. These indivi-

duals recognized that an earlier version of the hospital's financial DSS contained clinical cost and quality related fields (e.g., service index master or SIM codes, length of stay or LOS, mortality rates) that could be modified to provide cost data reflecting physician's clinical behaviors. Additional fields including external benchmarks (e.g., national average LOS and expected costs) were added in the clinical DSS to track and compare physician-driven costs and patient outcomes. As indicated in Figure 3, the added value of the new clinical DSS would result from processing the patient's billing data with the clinical cost and outcome indicators.

In order to provide support for decision making, the clinical DSS would track the activities of each physician. It would capture data for each patient's activity at the day-of-stay level via over 100,000 service index master (SIM) codes. A SIM code represents the number, charge, and cost of a single chargeable item prescribed (such as an aspirin) or procedure labor (such as physician's charge for an operation) or laboratory tests in caring for the patient. Through the record of the patient's attending physician, the DSS would track each SIM consumed for each day of stay. This would provide a detailed chronicle of the physician's practice behavior in treating a patient and a window on the quality of performance. The design allowed data to be aggregated and viewed in a number of ways, including all patients treated by an individual or a group of physicians.

As the project progressed, the administrators grew more excited about its potential. Several SJHS managers were convinced this would help them isolate the cost drivers and exercise better control over operations. They saw the clinical DSS as a mechanism to share their captured information with the physicians, a way to finally learn about the patient care process, and hoped that this would provide a forum for management and the physicians to focus on cost and quality improvements. With the design complete, the CFO instructed the clinical administrative directors to introduce the DSS to physician practice committees throughout the hospital. The vignette in Figure 4 describes the clinical administrative director's presentation to

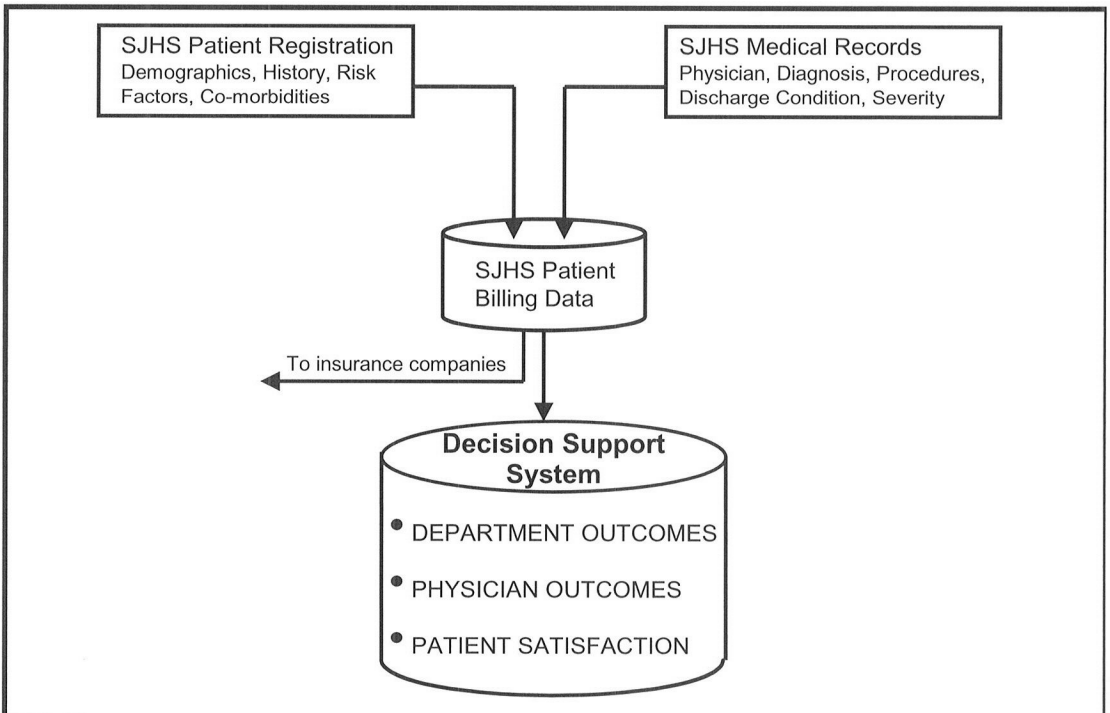


Figure 3. The Decision Support System Architecture

The first September meeting of the Cardiologists peer group committee commenced with the clinical administrative director (hospital administrator) introducing the clinical DSS to the physicians and presenting a performance analysis beginning with aggregate data for the cardiology practice area. This was followed by analyses of cardiology major diagnoses and procedures and the range of costs and outcomes. Finally, the analysis drilled down to a distribution of costs and performance by physicians in the disease categories. The names of physicians were disguised for the presentation.

The DSS report indicated that among the 15 cardiologists in the department, the length-of-stay (LOS) ranged from 5.5 days to 9.1 days. The corresponding charges ranged from \$10,525 to \$19,950 per patient. The median LOS and charges were 7.5 days and \$14,000 respectively. The clinical administrative director announced that if the higher cost physicians practiced at the median levels, the annual opportunity for savings would be \$3.2 million at current volumes and a two-day shorter stay for the patients. Referring to the recent studies, the director reminded the physicians, that longer LOS is strongly correlated with greater risks of infections and subsequently higher costs.

"The choice is ours," he announced. "We can ignore this opportunity until managed care forces us to change or we can control costs and have sufficient funds to make an investment in our future...a future that will enable us to improve further with the latest technologies and techniques."

Figure 4. A Vignette Demonstrating the Cardiologists' Use of the Clinical DSS

a Cardiologists' committee. As a result of the presentation, a group of cardiologists and six physicians from other practice areas including pulmonary, neurosurgery, and trauma called the DSS project directors and made appointments to discuss their performance outcomes. The chief of Cardiology inquired about the accuracy of the DSS' information. Following cooperative design iterations between the DSS project leaders and the physicians concerning data extraction, the cardiologists suggested filters for outlier cases, benchmarked adjustments for patient severity, and other conditions that skew the data. A consistent set of criteria was created to equitably compare physicians serving patients with varying levels of severity and co-morbidities even under the same disease categories. It was particularly gratifying to many hospital administrators when these early adopting physicians acknowledged that the DSS accurately represented their clinical practices in terms of cost and outcomes. As the director of continuous quality improvement reported, "What was once a black-box is now transparent."

The project with the cardiologists resulted in a net savings of approximately \$350,000 in the first year. Three projects followed similar paths in other departments leading to reduced costs, length of stay, and complications. Based on this early success, the DSS project leaders were ready to work with any physician who called for assistance and their roles were dubbed "Have laptop, will travel!" For a while, the frequency of use and complexity of requests did increase rapidly among this core set of early adopting physicians. Cost savings and positive results of the clinical DSS use by these early adopters were presented at DSS users' group meetings of SJHS sister hospitals as well as at clinical conferences. However, in the ensuing months, only the same physicians requested and utilized the DSS data with few new physician requests emerging.

Intervention 1: Evaluating

The evaluation step examines whether the theorized effects were realized and whether these effects relieved the problem (Baskerville 1999b,

p. 16). Soon it became clear that the early interest and demand for data from the physicians was not growing as expected. While the Cardiologist group (and other early adopters) deemed that the information system was producing information representing their clinical practice behaviors (e.g., achieving transparency), other physicians refused to even get into a conversation concerning the benchmark information's value, questioning the legitimacy of administrators to raise the issue of physician medical practice changes. When asked by either the CFO or the DSS project leaders why additional physicians were not requesting to learn more about the DSS, the clinical administrative heads reported that "*I have presented the system...but it was up to physicians themselves whether they wanted to use the data or not!*" The DSS project leaders' situation soon switched from *Have Laptop, Will Travel*—a reference to wild-west gunslingers confident and ready to solve any problem—to *Maytag Repairmen*—a reference to washing machine repairmen who sit waiting by the phone to receive problem calls that rarely come.

The action researchers asked: *What were the reasons for the failure of the wider physician community to utilize the clinical DSS?* Some non-adopting physicians stated that severity and co-morbidity differences in the levels of patient sickness was unaccounted for and called the validity of the data into question. Others reported that the DSS project leaders and hospital administrators were not qualified to interpret clinical performance data and set guidelines. Still others complained that the system was unnecessarily burdensome because it required a non-medically trained DSS analyst's assistance to execute reports as opposed to the physicians doing it on their own. Many physicians saw little incentive to use the system and treated it as administrative overhead and "something that the hospital management wanted" but was irrelevant to their primary clinical duties.

A further round of follow-up interviews by the project leaders with the cardiologists as well as other early adopters revealed that it was not an agency theory explanation of greater information transparency that drove these early adopters to

greater goal congruence with management. For example, as one cardiologist claimed, *"the fact that the hospital administrators can now see my charges and outcomes has very little effect on my motivation to make changes in my practice."* Others said that they *"cared little about what the administrators thought but a great deal about what their colleagues thought of them."* Probing deeper into the intra-workings of the cardiologist adoption decisions, the action researchers learned that the cardiologists agreed to use the DSS to benchmark their performance with their peers because they were concerned that *"recent reports claimed that patients treated by internists [a potential competitor for patients] for unstable angina might have better outcomes than cardiologists resulting in lower costs"* (see Schreiber et al. 1995). This issue was raised by one of the peer physicians during a clinical practice group meeting. In essence, it was peer-based influence to protect their clinical practice group's economic turf rather than the direct appeal of management that sparked use of the performance information provided by management. Further discussion with other early-adopting physicians revealed physician-bound (as opposed to hospital) economic issues drove their change, while still other early-adopting physicians gave reasons that can be classified as altruistic in nature, indicating *"we are obligated by our profession to use any tool that helps improve [our] practices and patient's efficacy."* As one early-adopter physician said, *"we're such [people] that we would have used the system [clinical DSS] anyway, not because the hospital persuaded us to, but because it helped our patients."*

Intervention 1: Specifying Learning

In action research, researchers apply a theory in a real-life situation and gain feedback from the experience. In evaluating the learning in Intervention 1, it was clear that an information system could be built to monitor physician behaviors by making them more transparent. However, the ultimate management goal of achieving substantial cost reduction resulting from behavioral change in physicians' practices was not borne out. The

limitations of information transparency alone as a management control intervention in a clan context were surfacing. Specifically, while physicians (e.g., the cardiologists) acknowledged that their clinical practices were made transparent to the hospital management as a consequence of the DSS implementation, most physicians did not feel compelled by this informing to make changes to their practice behavior because they believed that management lacked the legitimacy to affect, or even ask for, such actions. In essence, lack of legitimacy seemed to be moderating the expected control effect (Figure 5). This is typified by one occasion when a DSS project leader passionately presented analysis that demonstrated hospital cost savings if physicians altered their treatment protocol. A physician challenged the project leader's legitimacy and, pointing to the project leader's name badge, said, *"Excuse me, but I don't see 'M.D.' after your name."*

Coombs et al. (1992, p. 69) highlight the fundamental legitimacy problem facing management when introducing IT to control physicians:

Legitimacy is rarely the product of unfettered consensus. Rather it is the outcome of competitive struggles over the materials and symbolic resources whose asymmetrical distribution routinely privileges the claims of some agents in the exercise of control. It invites resistance insofar as the identity and/or power of the individuals and groups is sensed to be challenged by the new practices and discourses.

These findings are also consistent with those of Wallace (1995), who indicates that professional agents are more likely to be committed to the control of management when they are highly dependent on them for career advancement and when management has the legitimacy to distribute rewards, both of which were fundamentally lacking at SJHS. Learning from early adopters indicated that a fundamentally different approach had to be taken that recognized management's inability to readily improve their legitimacy relative to the clan but instead focused on improving physician recog-

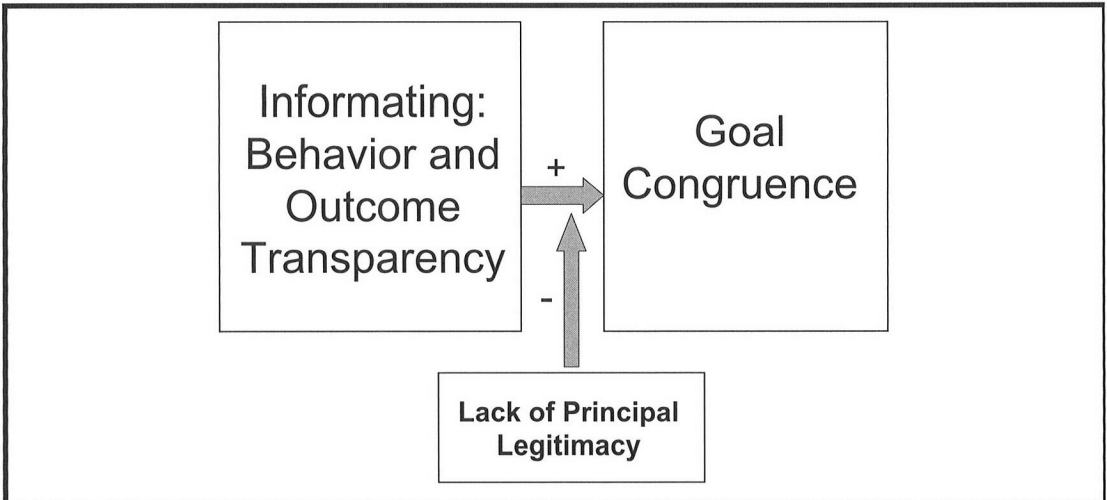


Figure 5. The Lack of Principal Legitimacy with Physicians' Proposed Change Path

nition of the information provided by management as legitimate. This would require a second, more indirect, intervention focusing on facilitation. In essence, an intervention had to be designed whereby the physicians themselves sought the management-provided information and introduced it themselves into their own clinical practice group discussions such that it directly appealed to their own values, rather than those of the management.

Intervention 2

Intervention 2: Diagnosing

Kaplan and Shaw (2002) call for more studies that promote learning from not just the successes of medical informatics but also from failures and partial successes, and particularly how failures became successes. Often, such iteration adds to theory as new insights emerge (Avison et al. 1999; Kock et al. 1997). Intervention 1's *learning* was presented to the CEO and CFO, both of whom remained frustrated at the failure to get a majority of the physicians involved in pursuing their cost control goals. However, both stated that they wanted to move on with what was learned and pursue alternative approaches to seeing initial cost

cutting benefits from the early adopters extended to the wider physician community. They asked the DSS leaders and director of continuous quality improvement to devise a follow-up line of inquiry. Given the failure of Intervention 1 to replicate control benefits of information transparency in the context of physicians, the action researchers recognized that the concepts of informing had to be extended to fit the reality of clan-based concertive control.

Clan control has been addressed by Ouchi (1980) and Wilkins and Ouchi (1983) as well by a number of IS researchers (e.g., Henderson and Lee 1992). According to Ouchi, clan control structures evolve under conditions where neither behavioral observability nor output measurement is possible. Clans gain their legitimization as professional entities from their asymmetric technical knowledge (Ruef and Scott 1998). Direct attempts at managerial control of a clan often fail because of the lack of technical legitimacy on the part of the principal (Sharma 1997). Rather, clan control is primarily peer-based and tends to convey information through traditions and assumes that members' commitment is driven by professional identification and common culture. This communality reduces opportunism due to the greater similarity of norms, beliefs, and values between members. Wilkins

and Ouchi note that expertise-based clans reinforce the overarching values that shared efforts are the best way to realize one's own efforts. Shared values and traditions foster trust and dedication to common goals. This increases the likelihood that choices between strategic roles will serve the profession and that such choices will not be made opportunistically. Clan controls also provide some assurance that arguments and disputes over competencies will be settled based on the clan's interests, rather than the interests of particular individuals. The degree of expertise required to practice medicine, the peer-based credentialing and sanctioning, and cultural traditions suggest that the physicians at SJHS operate under clan-based control.

While clan control seems to be descriptively parsimonious of the control of SJHS physicians at the time of Intervention 1, it does not provide a process description of how changes in practice are normalized within the clan, or how new ideas or information affect the clan's control processes, nor does it offer much promise to management for an indirect influence strategy to change physician behaviors. In addition, traditional concepts of clan control paint a picture of an organizational environment where behaviors and outcome are not observable. However, the new reality at SJHS was that the clinical DSS proved that it could make such behaviors and outcomes transparent (i.e., the cardiologist example). Rather, it was the clan's power to reject compliance with management's direct appeals for behavioral change, even when the practice appeared to be costly or of comparatively lower quality, that posed the biggest concern. It was determined by the action researchers that an extension of the concept of informing that better explained *how* the clan could use legitimized benchmarking information within their own normative control processes was needed if management was to have even an indirect influence over physicians' use of a performance monitoring system. The action researchers found answers to these concerns in the theory of concertive control.

Concertive control is achieved by the pressure of peers in self-managed work group situations and

has been observed in routine and non-routine tasks and in stable and unstable environments (Barker 1993; Tompkins and Cheney 1985; Wright and Barker 2000). This form of control represents a shift in the locus of control from management to the workers themselves, who collaborate to develop the means of their own control. Work group members achieve concertive control by reaching a negotiated consensus on how to shape their behaviors according to a set of core values. This negotiated consensus creates and recreates a value-based discourse that peers use to infer "proper" behavioral premises and may be reinforced by peer-based surveillance and sanctions. In the concertive organization, the locus of authority (i.e., what actors see as the legitimate source of control to which they are willing to submit) is transferred from the bureaucratic or individual to the value consensus of the members and their socially created rules system (Barker 1993). When the bureaucratic establishment (management), through the use of IS, attempts to introduce information into the concertive control processes to indirectly influence consensus building activities among the clan members, we refer to it as *informing the clan*. Extending past authors' observations of concertive control in traditional work groups (e.g., Barker 1993), informed concertive control processes in the clan context consist of the following sequence of activities:

- (1) A work group, with clan-based legitimacy derived from similar training and shared professional culture, formalizes a process to consider a new message (information which may be provided by management) with the possibility of changing behavior toward a best practice. By participation in the group's authoritative discussion and mutually shared sense of rational action, some individual professional autonomy is surrendered.
- (2) Introduction of the new information, often by an influential messenger (e.g., an elected committee head or a peer in close proximity by distance or by friendship), concerning a problem, concept, or innovation challenges a commonly held belief or practice.

- (3) Following a discussion of the new information and based upon the merit of a practice change given the shared values and the influence of the messenger, the validity of the new practice is either rejected or strengthened.
- (4) Over time, shared values push for a strengthening of normative expectations associated with an accepted practice. Norms prescribe that the group members should follow the new practice. Conformance to such normative expectations protects individuals from criticism, while failure to do so may leave the individual vulnerable to possible sanctions. This might be expressed in terms of expectations of other peers or (formal or informal) enforcement of punitive influence.
- (5) The possibility of punitive consequences as well as desire for conformity pushes for rule formalization related to the accepted practice. The formal rules for accepted practice stay in force until the interpretation of new information by influential peers challenges the established practice in congruence with shared values, at which point it uproots the existing practice and begins another cycle of concertive control.

As can be seen in the above cycle, performance information is often introduced to the concertive control process by an influential peer (e.g., boundary spanner, chief of a practice group, higher performers, etc.). Influence is the ability to affect behavior of others in a particular direction (Bacharach and Lawler 1980). Among clans, information passed among peers comprises influence (Tannenbaum and Massarik 1950) and a person exerts influence through influence tactics (Yukl 2002). Among the most successful influence tactics used in a peer-based influence context, such as concertive control, are a combination of inspirational appeals, consultation, and rational persuasion (Falbe and Yukl 1992). In inspirational appeals, a legitimate peer arouses enthusiasm by appealing and aligning to others' values. The consultation influence tactic seeks participation and assistance in planning a change and rational

persuasion is designed to use logical arguments and factual evidence in the attainment of task objectives. Concertive control is dependent on influence by a legitimized messenger's appeal to clan members' values to gain commitment. Sewell (1998) suggests that when this type of control is initiated, work groups tend to go beyond minimum expectations and normalize performance around best performers. The overall proposed control process can be summarized by the following sequence representing clan informing. Italicized segments represent concertive control.

Clan-based *legitimacy* [gives] → *influence* [which combined with] → *tactics*, that may include the presentation of management provided information [appeals to] → *values and beliefs* [leading to] → *commitment and compliance* [resulting in] → greater goal congruence between the clan and management.

Expanding upon Zuboff's (1988) definition, we define *informing the clan* as a managerial intervention whereby the principal, lacking legitimacy, indirectly introduces behavioral performance information (validated as accurate by the clan) through legitimized messengers as catalysts to stimulate the process of concertive control toward changes in the clan's normative patterns of behavior in greater congruence with those of the principal. In essence, lacking legitimacy, the principal introduces performance information (message) via messengers (human and/or technical) that possess the legitimacy (boundary spanner, influential peer group member, trusted performance enhancer) to exert influence upon clan members. The messengers help establish the information (or information system) as legitimate by the clan. Management's facilitation of intra-clan discussion (e.g., meeting support) can help to indirectly galvanize the concertive control process around the newly introduced information.

Proposition B: *In addition to a principal's ability to make the clan's (physicians') behavior and outcomes more*

transparent, a principal must mitigate lack of legitimacy by informing the clan's concertive control process via a legitimized message, messengers, and meetings to activate behavioral change toward greater goal congruence.

Intervention 2: Action Planning

In support of Intervention 2's proposition, the medical informatics literature (e.g., Kaplan 1997, 2001) indicates that differences in IS acceptance can, at least partially, be explained by their ability to appeal to physicians' values, while IS research points to the need to work within the complexities of user perceptions of legitimacy and information owner (Constant et al. 1994; Jarvenpaa and Staples 2001; Wareham et al. 1997). In such circumstances, a values-driven (Bloomfield and Coombs 1992; Wareham et al. 1997) and more indirect, peer-based (Henderson and Lee 1992) control approach seems to be in order. Incorporating the concept of informing the clan's concertive control process, a new intervention with a new change path was devised (see Figure 6).

The Human Messenger

In contemplating the steps taken to get physicians' active participation in controlling costs, a clinical administrative director summed up the shortcomings of previous efforts in a meeting with the CEO:

Doctors see us as the voice of the management and don't really understand the hospital's urgency for cost control and quality. Maybe if there was a doctor telling them, they would listen to one of their own.

Consequently, the CEO decided that a boundary-spanning physician be appointed to an administrative position (director of physician integration) as a liaison human messenger between the SJHS management and the physicians. This person

would be employed by the hospital and would be a respected physician with clan-seeded legitimacy. It was proposed that the physician protagonist should be an early adopter of the clinical DSS, committed to the hospital's goals of cost containment and quality patient outcomes, and be able to manage symbiotic relationships between the hospital and its physicians.

The Technical Messenger

Beyond using a boundary-spanning clan member as a legitimate informational source to push peer usage of the planned system, it was recognized that cost and outcome information had to be more readily internalized by the physicians. Emphasis needed to shift from the clinical DSS mode of management delivering periodic reports to physicians upon request to a situation where the physicians perceived they were executing their data on their own to improve their own performance. One of the action researchers proposed that the performance outcomes generated from the clinical DSS could be analyzed, customized, and made available on the physician's desktop instead of paper reports from management to enhance the sense of informational spontaneity, ownership, and trust. It was decided that the new system would access the same core performance data as the clinical DSS but would emphasize a user-friendly Web design facilitating self-sufficient use of the system as a communication tool between physicians as much as a benchmarking tool displaying performance results for committee presentation. Many reconfigured benchmarking and report templates would be adjusted for severity, co-morbidities and outliers and made available to the physicians so they could configure reports "on the fly." The DSS project leader stated this would be a "complete about-face" from the previous highly IS-dependent clinical DSS. In the spirit of concertive control, talk began surfacing of a physicians' profiling system (PPS) that would operate as a peer-oriented monitoring system rather than a clinical DSS.

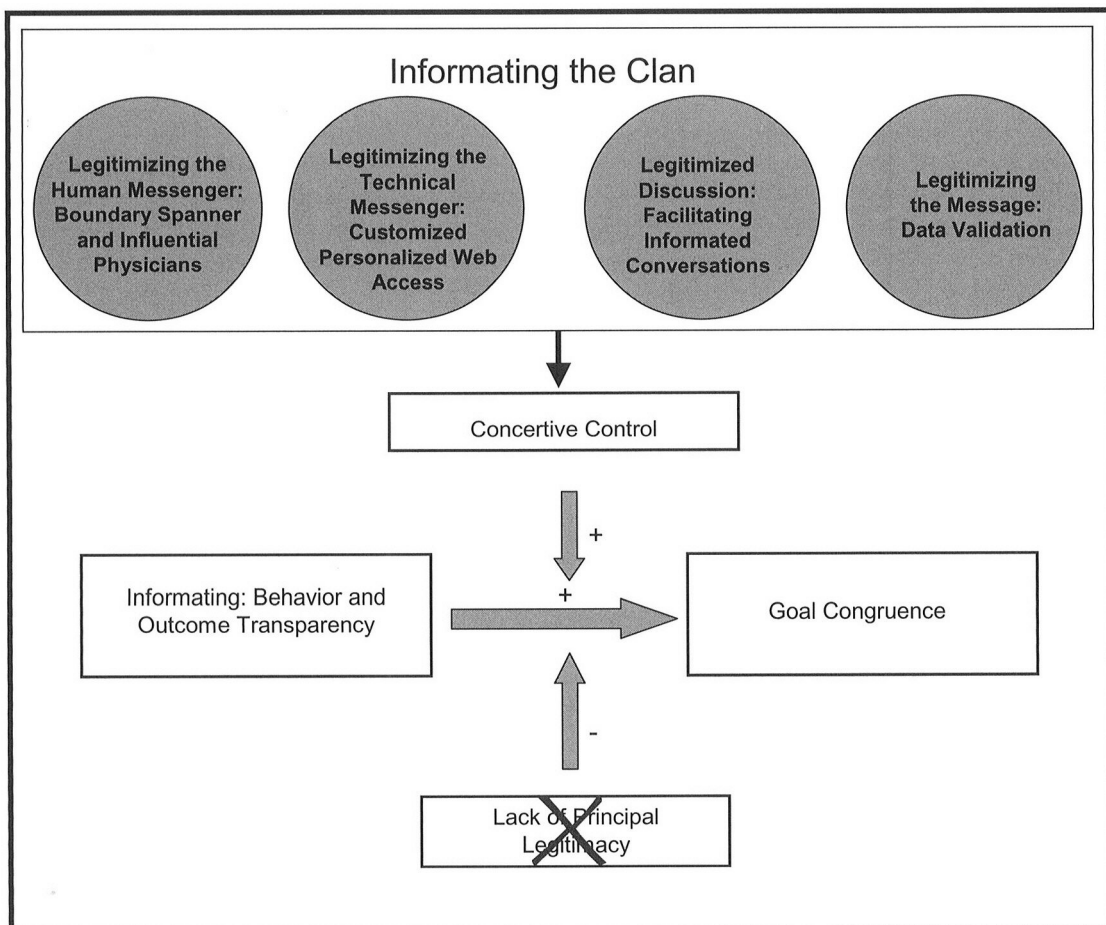


Figure 6. Intervention 2: Informing the Clan as a Counterbalance to the Lack of Principal’s Legitimacy

The Discussion

Recognizing the importance of clan-based influence in one-on-one and formal specialty group meetings, the action researchers proposed that the newly designed system should easily accommodate clan-based discussion. A critical design decision was the capability for unassisted real-time access to the data warehouse so that physician profiles could be generated as often as needed. Physicians could view and talk with a colleague about their performance from the privacy of their office, without an administrative employee present. The DSS project leader stated that under the new model “we would work with the new director of

physician integration and several early adopters in the design to get a better feel for how exactly physicians use benchmarking data in meetings and one-on-one conversations.” The basic notion grew that the information from the PPS had to be subsumed into physician’s conversations whether they were in the boardroom, break room, operating room, or the country club locker room.

The Informational Message

Using a customized self-service informational interface combined with the legitimacy of the new director of physician integration, Intervention 2

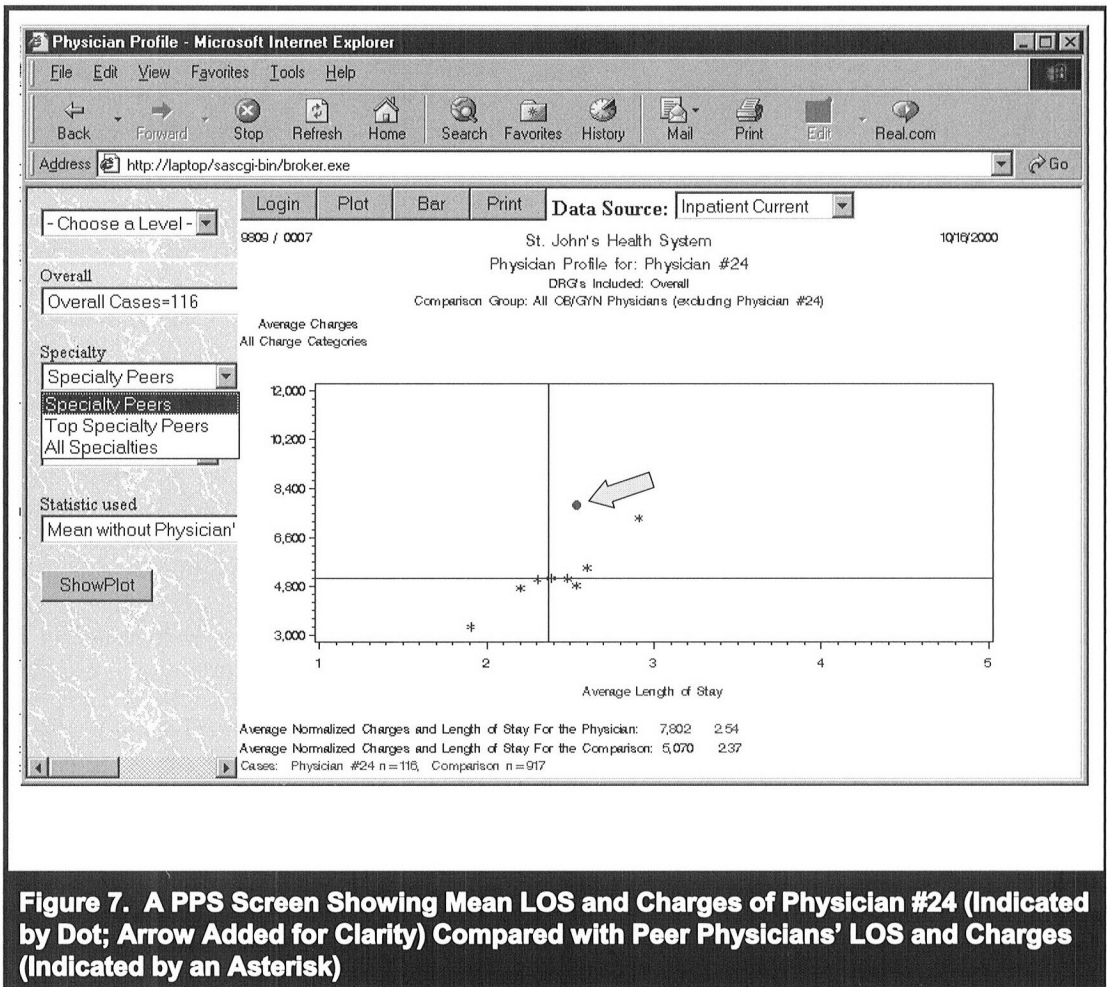


Figure 7. A PPS Screen Showing Mean LOS and Charges of Physician #24 (Indicated by Dot; Arrow Added for Clarity) Compared with Peer Physicians' LOS and Charges (Indicated by an Asterisk)

would informate the clan member discussions leading to concertive control behavioral changes indirectly influenced by management-provided performance information. Under this approach, the validity of the informational message would be more widely accepted by the SJHS physicians. Consistent scrutiny by peers would further expose their behaviors to comparison with best practice work standards and, with the influence of the new director of physician integration and other influential peers, bring the clan in closer congruence with the hospital management's cost cutting and quality improvement goals.

Intervention 2: Action Taking

Following action planning, an early adopter and a well-respected physician, Dr. Gary Brazel, was appointed as a director of physician integration. Dr. Brazel's overall charge was to bring SJHS cost containment and quality values to the physician community and the physicians' viewpoint to the development and refinement of the profiling system—in essence, to assume the role of a bridge between the principal and the agents based on his legitimacy as a physician. Using information technology as a tool, he was to informate the

concertive control process by highlighting physicians' outlier costs and quality profiles and bring them closer to the clan-based norms. The resulting PPS presents patient demographics and conditions through the patient registration system, while the medical records system provides the diagnosis and procedures tied to a physician's practice of medicine. Through its Web interface, the PPS delivers cost, quality, and satisfaction outcomes customized for each physician. The reporting capability allows physicians to compare themselves with the peers in their specialty or a larger group of specialties (see Figure 7). Outcomes can also be compared for the overall practice group relative to others.

Special attention was paid to those issues that might impede physician acceptance of the PPS. For example, with the design assistance of Dr. Brazel and numerous early-adopter physicians, patient outcomes were adjusted for severity so that the medical resources consumed were reflective of the appropriate level of needed care. Dr. Brazel would then take the "Beta" versions of the system to receptive physicians or practice group committee directors to further probe the validity of the information. Such interactions resulted in psychiatric and newborn patients being excluded because they were determined to have high and largely varying LOS, not necessarily reflective of physicians' practice patterns. Similarly, transferred patients and deceased patients were excluded from the processing of physician profiles. Through collaborative interactions with physicians, the information was receiving widespread acceptance as a valid indicator of clinical behaviors and outcomes.

In its implemented form, the PPS was accessible to authorized individuals through the Internet browser on all personal computers of SJHS. To address privacy concerns, the PPS was housed on a dedicated secure server and another server authenticated each incoming Web user. The CIO ensured that the PPS facilitated direct, unassisted access by any physician, yet also allowed physicians to jointly view their outcomes in greater detail, if they so chose. The overarching design and implementation goal, summarized by a project

leader, was to "make the PPS another relied-upon tool in the physician's daily schedule to examine costs, compare with peers, understand drivers of the outcomes, and develop plans for action." However, if they needed assistance, Dr. Brazel was available to jointly develop and implement a plan of action that would help ensure that practice changes would be facilitated by all relevant hospital staff. For example, at a performance improvement committee (PIC) meeting comprising cross-functional senior physicians, Dr. Brazel discussed how the past DSS-based projects had resulted in reduced costs and higher quality—using the Cardiologist group as the poster child. Physicians were personally encouraged to provide input regarding the interface for the PPS, normalizing the data, and the choice of indicators of cost and quality. Dr. Brazel persuaded them to regularly examine their performance from the privacy of their offices "not for the hospital's sake, but for their own." He further pointed out that *"the physician's goals and the hospital's goals are not all that far apart if we only had the time to think about it—which unfortunately we usually don't... hopefully the PPS makes it a little easier for us [physicians]."*

Dr. Brazel and the hospital chief of staff (physician equivalent to the hospital CEO) arranged bi-annual meetings with physicians in their offices to discuss the PPS findings, where Dr. Brazel attempted to get the physicians online if they had never accessed the system. He often worked with the physicians to address concerns arising from special circumstances, such as treating high-risk patients, and requiring adjustment in development of a profile. He made it known that the DSS project leaders and clinical analysts were working closely with him and that they were available to work with physicians who wanted to learn the PPS capabilities more extensively or "push its limits." Dr. Brazel also targeted outlier physicians for more frequent consultations. Carrying copies of their benchmark comparisons, he would set them on their desks and then offer his services. In some cases, his assistance led to findings that a physician might match the peer norms but due to improper coding (documentation) his/her associated costs appeared higher on the PPS. A

number of such findings led to a change in the documentation process of patient charts. Overall, Dr. Brazel's persistence and legitimacy, coupled with growing trust of the PPS' informational validity to the physicians' everyday responsibility, established the right conditions for subsequent peer-to-peer communication using PPS information within clinical practice groups.

Intervention 2: Evaluating

In Intervention 2, management learned from the failures of Intervention 1 and instead chose indirect informational influence in attempting to trigger appeals to clan members' shared values in their concertive control process (as previously shown in Figure 6). It was recognized that the clan members themselves must reach a negotiated consensus on shaping behavioral changes according to their own set of shared values. This approach minimized pretense of management legitimacy for direct requests for clan clinical behavioral change and instead focused on improving the perceived legitimacy of the information itself in the minds of the physicians. In essence, management was resolved to informate the clan to introduce information they provided into the concertive control process as outlined in the example narrated by a radiologist who regularly attends the meetings:

Driven by the desire to continuously improve their practice outcomes, the radiology physicians set up procedures whereby each must review assigned problem cases as benchmarked by the PPS and then discuss appropriate diagnoses, treatments, and issues of quality at biweekly group meetings. The radiologist whose actual problem case was being reviewed remained anonymous. After the problem case was presented, each physician must discuss his or her proposed diagnosis and treatment plan. Later, the actual diagnosis and outcomes are revealed and discussed. Typical of such a discussion, an influential physician might present his/her approach wherein he/she successfully treated the

problem with higher quality and/or lower cost. A spirited discussion often ensues by those who do not subscribe to this efficient-effective procedure. Following a debate about the effectiveness of the new approach and the general usefulness of the evidence-based medicine, the group agrees whether to adopt the new protocol in their practice. Along these lines, a physician influences the group practice pattern by inculcating his or her successes into the discussion and eventually into the PPS.

By 1999, radiologists were routinely reviewing PPS updates on their own and anticipating the effect of changes on their own practice outcomes. In essence, the PPS was internalized as their feedback system for practice changes relative to the group. The group then formalized community standards of practice that demonstrated consistent improvement as practice guidelines, known as *clinical pathways*. In addition to improving their collective learning, the concertive control process helps the physicians interpret *shared values* through which quality-conscious physicians learn from other quality-conscious peers. Recognizing that quality and costs are inherently linked, the radiologists end up discussing the costs incurred when they fail to make the correct diagnosis. Although the physicians' primary focus is on quality, the discussion of cost containment brings them closer to the hospital management's goal of controlling costs while setting examples of high-quality practice for other physicians.

An important evaluation criterion of successful action research is that interventions ultimately result in planned outcomes. In this regard, SJHS financial reports indicate that in the first year following the PPS implementation, there was a decrease of \$172 in the costs per case, leading to an aggregate savings of \$474,119 for SJHS. Since SJHS is reimbursed at predetermined rates, cost savings result in higher profitability. Quality indicators improved as well. The average LOS decreased by 0.06 days per case. To verify distribution of improvement, the action researchers examined each clinical specialty and found cost

decreases in all, except Internal Medicine. Dr. Brazel presented the findings with kudos for the physicians and indicated that Internal Medicine was an area for future improvement opportunities. At the conclusion of this study, the mean savings had improved to \$405 per case and a total of \$1.42 million. The corresponding average LOS decreased to 0.24 days/per case.⁸

After two years of PPS use, the CEO and CFO were pleased with the progress and the intervention path selected. While they saw the cost cutting as promising, they voiced a desire to see cost reductions continue at current levels. They were particularly pleased with increases in patient satisfaction while LOS continued to drop. Dr. Brazel and the DSS project leaders remained actively engaged in marketing and modification of the PPS and system usage data showed consistent usage growth. It was not uncommon to see or hear physicians discussing their profiles in the physician lounge or over lunch. Physician legitimization of the PPS was further evidenced in the number of suggestions for more data fields and the removing of outlier cases to refine PPS results. With physicians' growing demand and trust of the PPS information, they grew less sensitive in seeking the advice of DSS project leaders and analysts. While the DSS project leaders were typically not privy to the physician's peer-to-peer performance discussions, they were occasionally called in to clarify some issues with the data. It was during these instances that they were particularly gratified to see how intuitive the interface design and report navigation schemes were for even the most novice user; they often left a physician's office with two doctors pointing at a

PPS screen in intense discussions about some practice change.

At the conclusion of this study, the PPS information is pervasive among a majority of the practicing physicians. Physicians are self sufficient in developing their own PPS profiles and details of cost drivers and outcomes often spark healthy debate in clan interaction. They view it as a system driven by the norms set by themselves and their peers, not the hospital's management. Dr. Brazel indicates that physicians have made substantial inroads in getting a good number of the later adopters to experiment with the PPS and a smaller, but substantial, number is making routine use of the PPS as a part of the practice procedures. He sees the prospect for adoption and associated behavioral changes continuing to increase over the next few years but doubts that the PPS will reach a 100 percent adoption rate. He claims that there is a contingent of physicians that are highly independent, less communicative, less influenced by the values of the practice groups *"that type of [doctor] may never use the PPS unless they are being challenged in a legal matter."* Based on the cost and outcome improvements, the project was viewed by most participants as a long-term success. In thinking about the role that informing and concertive control played, Dr. Brazel indicates that the PPS activated physician's values that sometimes differ from the hospital's, but apparently there was enough commonality in their pursuits that the hospital was achieving its desired goals of cost reduction and quality improvements indirectly through the concertive control exercised within the physician practices groups.

Intervention 2: Specifying Learning

This action research project's findings furthered our understanding of informed, clan-driven, behavioral change among physicians who are less likely to be influenced by bureaucratic or agency controls. Past research has found that physician clinical practice is determined by social arrangements within the clinician's group (Aarts and Peel 1999) and that physicians influence other physi-

⁸The action researchers also examined the patient satisfaction data to rule out the possibility that the financial gains were being realized at a cost of the perceived quality of care. The patient satisfaction data indicated a modest but steady increase in patients' satisfaction outcomes. In addition, the range of physicians grew to include all departments of the SJHS. The number of queries regarding PPS use also grew. To protect their privacy, the hospital does not track physicians' actual usage. However, the system log files indicate that each physician's password was activated during the first year of PPS use.

cians' attitudes determining information systems usage (Anderson et al. 1987). This research extends these findings by introducing the *how* of an informed concertive control process within physician practice groups. Initial findings suggest that hospitals can indirectly influence clinical practice in closer congruence with its goals by informing the concertive control process through the "3 M's" (message, messengers, and meetings). Specifically, while Intervention 1 demonstrated that lack of legitimacy moderated expected control benefits, informing the concertive control processes appears to mitigate this lack of legitimacy as outlined in Figure 6.

Similar to the earlier literature on worker-regulated social norms (Trist and Bamforth 1951) and the other early proponents of action research (Lewin 1946), understanding control in professional physicians involves understanding the values that motivate behavioral change (Kaplan 1987, 2001). Values are individual beliefs that form the ultimate rationale or action (Rokeach 1973). Values form the basis for consensus or conflict in reaching group norms. A comment made to the PPS analyst by an influential radiologist and routine user of the PPS highlights this point: "*Show me that by following a [treatment] protocol I will be efficient and perhaps have more time for my golf game, I will listen.*" In this regard, the action researchers were interested in identifying the set of values most commonly appealed to by the PPS in the concertive process affecting practice changes at SJHS. Based on follow-up interviews, the researchers identified four values (e.g., economic, status, altruistic, and legalistic) that the PPS activated through procedural talk and interaction between the physicians. These values, when appealed to, appear to prompt a sense of obligation or necessity to consider the PPS information relative to their or their colleagues' practices. These identified values are described in greater detail below.⁹

⁹In our discussions with management, they hoped that physicians possessed a bureaucratic value framed in terms of compliance with a strong resource management rationality for cost cutting benefitting the hospital's bottom line. However, our interviews with physicians showed that while they voiced an economic value

Economic Values. Economic values are manifested when a physician feels obligated to use the PPS to derive greater economic value to him/herself and/or the group. For example, an early adopter of the PPS suggested that he should use the PPS profiles as a low-cost mechanism to monitor performance. Another physician feared that insurance companies might begin *economic profiling*, a term that implies that physician with high costs may be excluded from preferred physician groups. Because the physician might not get patients covered under these insurance plans, such exclusion can affect future income. Finally, the Cardiologists' example, discussed earlier, was indicative of how these economic perspectives can be amplified through the shop-talk process of concertive control to result in practice changes.

Status Values. Status values among physicians stem from the competitive desire to excel and perform better than one's colleagues. When the profile of a top performing laparoscopic surgeon indicated higher costs in a certain procedure, she asked to review the item-level detail of each surgery. When compared with the peers, the physician discovered that she was using a \$200 disposable instrument for which others use a non-disposable one, with no higher infection risk. She changed the practice and regained the status of the best performing laparoscopic physician on staff. She relished sharing this status with her colleagues at the peer group meeting.

Altruistic Values. Some physicians insisted that changes in their practice were driven primarily by the altruistic goal of the patient's best interest. A vascular surgeon was preparing to insert a tube in a terminally ill patient who suffered from other complications. A senior physician who had examined his own profile determined that this procedure costs significantly more but leads to no better outcome; in addition, his experience told him that the procedure is painful for the patient. By

beneficial to themselves and/or their practice group, they did not strongly voice a value-driven desire to comply with management direct appeals for bureaucratic control.

sharing this experience, he persuaded the attending physician to consider other, less painful and less expensive alternatives that respect the dignity of a terminal patient.

Legalistic Values: Physicians fear that by ignoring the cost and quality performance data, they may be risking internal (clan-based) disciplinary action or accreditation probation. Following a review of the profile, a physician approached a peer physician to discuss his performance outcomes. He recognized that if he did not attend to the quality issues, he could be placed on probation or possibly even sued. By confiding in the peer, he identified specific tests and procedures that needed to be modified. The PPS profile served as an early warning system to ward off potential malpractice and malfeasance litigation.

Values drivers, similar to those identified in this action research, have been recognized by previous research in the health care settings; for example, it has been found that people's altruistic, organizational, and social values, if unaddressed, can lead to resistance (Anderson and Aydin 1994; Kaplan 1997; Kuhn and Guise 2001; Lauer et al. 2000). Professional status, a social issue among physicians, was examined during the implementation of a records and clinical guidance system (Fischer et al. 1980). Similarly, appealing to physicians' economic values through incentives is cited as one of the reasons for widespread use of computers by general practitioners in the United Kingdom (Benson 2001) and a financial concern in the evaluation of IT in healthcare (Miller 1994). An important point of this study is that successful informing of the clan demands delivery of appropriate and actionable information (a legitimate message) in direct appeal to clan values. A legitimate message can be confidentially used by an influential peer in persuasion during concertive control discussions. Therefore, understanding the underlying clan values at work in unique organizational contexts will help management better design an IS that directly appeals to unique clan values.

Based on interviews by action researchers, followed by theoretically supported evaluation and

another round of interviews, this study found that while physicians in practice groups generally held the core set of shared values discussed above, individual physicians varied in degree as to what value(s) was (were) most likely to trigger a behavioral response. This observation is consistent with such researchers as Bandura (1977), who suggests that some people are more motivated by explicit motivators such as money, while others are more sensitive to intrinsic motivators such as promotion, self-actualization, or altruism. Generally speaking, early adopters of the PPS were driven more by economic, altruistic or status values. Later adopters appeared to respond more to economic or legal values. Without further research, it is difficult to say whether this order is context specific, but generally knowing which value(s) to address is critical to a better understanding of the socio-technological environment of the change effort.

Contributions and Implications for Research

Contribution Summary

As depicted in Figure 2, this study began as a replication of previous research in the context of physicians (i.e., IS induced behavioral and outcome transparency of an agent's work will result in higher control for the principal, as per agency theory and Zuboff's informing).¹⁰ With the failure to replicate greater control through IS under conditions of low management legitimacy (see Figure 5), this action research project proceeded

¹⁰By testing established theories and frameworks in a healthcare setting, this study attests to their efficacy and applicability in various disciplines. Berthon et al. (2002) express disappointment over the lack of replication studies in the MIS research space and call for replication or extension of previous research. They suggest that replication or extension research adds to interpretive methods (such as action research) because it focuses upon self-reflection and consequently the depth of knowledge. Extension research can contribute by extending the context, method, or theory of previous research.

to extend the concept of informing to the clan context and its concertive control process. Action research accepts such failures and, encourages researchers to apply learning to the reframing and selection of theories in subsequent research iterations. Thus in Intervention 2, the researchers strove to better understand the *how(s)* and the *why* of physicians' use of performance information systems to control their own practice behavior. Specifically, this involves an intervention to informate (*how* = 3M's—message, messenger, and meeting) the clan's concertive processes (*how* = steps of concertive control) with management-provided performance information to foster clinical practice changes appealing to clan values (*why* = appeals to four values identified). While this intervention proved quite successful in the context of SJHS, subsequent research must validate the success of the proposed prescriptions (*hows*) and associated casual relationships (as depicted in Figure 6) in other hospital–physician relationships.

In addition to applying the informing concept to the clan, this study contributes to previous research by demonstrating that a management-sponsored performance-monitoring IS, when implemented so the information is deemed legitimate, can activate clan communication processes centered on values motivating desired behavioral changes *even when management is not deemed legitimate* to ask for the desired behavioral changes. It was learned that designing a management intervention that achieves this result requires walking a very delicate legitimacy tightrope where management must avoid strong claims of managerial authority to affect control while indirectly informing the clan's concertive control process.

Additional Implications for Research

Understanding Legitimacy of Informing

To understand the efficacy of informing the clan, we must understand its power relationships. Barker (1999) recognized employees whose performance is monitored by an IS ascribe power

relationships to the types of control they experience. For example, in a study of a call center, Garson (1989) noted that employees found the monitoring of their calls to be stifling. Conversely, Zuboff (1988) reported that monitoring could engender the feelings of empowerment. In each case, the employees are ascribing meaning to the form of informing they confront, aligning the subject to acts of resistance or support. The crucial factor here is the same one that moderated the results of this study: *legitimacy*. Thus, as we have seen throughout this study, when considering informing, we must understand how members of an organization come to see the power relationships of informing as being legitimate. This is a challenging assignment as we saw in the several previously discussed case vignettes; as power relationships about informing are constructed in intricate and complex forms of discourse. It was observed that informing becomes legitimized through influence relationships both across organizational groups (boundary spanners and physicians) and within groups (chief, persuasive peer, inspirational peer, friend, etc.).

For IS researchers and designers, unmasking of power relationships may demand future use of research methodologies such as action research that can accommodate the fact that legitimization about informing comes through organizational discourse best tracked over time in close observation and involvement and because these power relationships are malleable they are best understood with a flexible research method that accommodates learning and subsequent intervention. In the case of the clan, this power relationship is particularly complicated in that the non-legitimate administration must first gain acceptance for its informing technical infrastructure through a legitimated boundary spanner and then inject the new information in peer-reviewed medical practices through influential physicians. Clearly, unmasking the power relationships of legitimacy was essential to the success of this study, and will be an essential step in future researchers' ability to replicate this study and validate its findings and, more generally, to identify and analyze the social consequences of informing.

Implications for IS Research

This research demonstrates that the clan informing to concertive control change path (see Figure 6) provides an important role for IS professionals as facilitators. IS researchers should test this informing/concertive control framework in other professional environments such as with lawyers and university professors. It should be noted that this project approaches the issue of clan informing to concertive control on a shorter-term practical basis. However, at a long-term macro level, future researchers might examine whether greater information transparency serves to lessen the power of the clan and increase the power of the hospital, the insurance industry, or governmental agencies. Exploring this question might be best examined by using institutional theory or, possibly, econometric modeling. Finally, this study draws into question the application of agency theory as a prescriptive approach in the context of more autonomous professionals, like physicians.¹¹ Past clan and agency literatures have generally examined the control relationships among actors within their boundaries of clan or principal-agent, respectively. Autonomous professionals present a unique situation where the clan and agency relationships overlap and put forward a new challenge to the understanding of control. How can IS/IT facilitate in this overlap? How can IS/IT serve as a bridge between the clan and management in other contexts? All of these areas

represent excellent opportunities for the IS researcher to continue this line of inquiry.

Implications for Action Researchers

The implications flow from the experiences of the action researchers over this decade-long project. First, action researchers participate in activities to serve the interest of the client and as such the needs of the client often determine what actions are practical and should be pursued. For instance, at the beginning of the project, information transparency was selected as the driving research premise because of SJHS management's enthusiasm engendered from the productivity gains achieved by the erstwhile PTS implementation. Second, future researchers should recognize that action research, by its nature, is long term and researchers should expect and accept shifts in internal and external contextual conditions. For instance, as our project was underway, the rise of managed care and the researchers' identification of the importance of physician values in shaping behavioral change made the concertive control aspects more relevant in Intervention 2. Third, although all researchers are expected to view the research context as neutral observers, the long duration and interpretive nature of action research challenges researchers to periodically question their own assumptions, despite the risk of being proven wrong. For instance, the ostensible adoption of DSS in Intervention 1 by some physicians made the action researchers question why they were not observing many other adopting physicians beyond the cardiologists. This led to the eventual dismissal of the agency theory framework. Finally, patience and flexibility are desired virtues among action researchers. As such, action researchers should defer judgment about success before complete evaluation and hopefully achieving client satisfaction. In our project, the DSS appeared to be successful for a while. However, it was soon clear that Intervention 1 had failed to involve the majority of the physicians in making practice changes. A second intervention was initiated and eventually saw the project to a successful conclusion.

¹¹It should be noted that notwithstanding the rich data resulting from this action research project, this context has limitations. Specifically, our study focused on the principal-agent (P-A) relationship in the healthcare industry. Although such professional P-A relationships exist in other disciplines such as higher education and the software development industry, it must be recognized that physicians represent an extreme case of knowledge asymmetry (even among knowledge professionals), making it more problematic for the hospital (principal) to design and enforce detailed contracts with this type of agent. For instance, although nurses and technicians are also professionals, their decisions do not drive hospital costs because they execute prescriptive clinical instructions from the physicians, the nature of the reporting structure between them and the hospital limits the formation of an authoritative clan, as defined by Ouchi (1979), and they generally do not have a peer-review relationship with each other, as do physicians.

Implications for Practice

The bad news of this study for hospital administrators is that implementing a performance monitoring system is not a silver bullet to direct control over cost. The good news is that informing the clan with a performance monitoring systems may be the best option management has for exercising any influence (albeit indirect) over physician clinical practice decisions. However, clan informing requires patience, a willingness to acquiesce perceived authority, and a desire to expend resources on an information system that will not necessarily guarantee immediate payoffs. As mentioned previously, IS designers must willingly unmask the power relationships of informing, a job that many are not accustomed to performing. In this context, success is determined by the extent to which the physicians' values are understood and can be appealed to with quality performance information delivered by influential messengers. Understanding the concertive control process, and how information is used within it, is important to understanding how physicians normalize practice changes. This involves refinement of the 3 M's of informing the clan (message, messengers [human and technical], and meeting facilitation). Management's best bet may be to identify a bridging project leader who understands the goals of management and the values of the clan. Such a legitimized influence leader can "jump start" the concertive control process by demonstrating how to use performance information in direct appeals to physicians' values. However, if the physicians perceive the influence leader as too closely aligned with management's viewpoint, this legitimacy will wither. Success is also dependent upon the physicians' perception of the quality of data. Physicians must be involved from the beginning in the design and agree to what data will be included or excluded in a high-level, yet meaningful, comparative dataset that takes into account patient severity levels, complications and co-morbidities, and outlier cases. Physician doubts about data validity will most likely impede legitimacy and must be mitigated by interactive rounds of data quality improvement. The hospital and the project leader should recognize that while some physicians will be early adopters, some will follow after they have seen the reaction of the early adopters and felt

their influence, and some may not follow at all. In the end, for management, informing the clan is like giving the clan a compass in the hopes that the clan will use it to steer clinical behaviors in a direction of closer goal congruence.

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Appendix A

Action Research-Based Study Criteria

Table A1. Action Research Evaluation Criteria and This Study's Characteristics

No.	Criterion	Study Characteristics
1.	The researcher must intervene into the subject under study	<ul style="list-style-type: none"> An action researcher, also a DSS expert, assigned to the project With participant consent, interventions data collected through observation and interaction
2.	The project must be collaborative and participants must be dynamically involved in determining the direction of the project	<ul style="list-style-type: none"> Action researchers collaborated with hospital administrators and physician participants; both dynamically determined the course of the project Preexisting trust moderated the need for formal control structure between action researchers and participants (Avison et al. 2001)
3.	The knowledge goals of the research should be interpretative and framed as understanding	<ul style="list-style-type: none"> Following interpretation of issues, interventions helped inform theory (Baskerville 1999a). Researchers avoided broad explanatory claims or experimental rigor in favor of situational interpretation of the human behaviors (Baskerville and Wood-Harper 1996; Straub and Welke 1998)
4.	Action research must yield a solution to an immediate problem situation	<ul style="list-style-type: none"> The cost-reimbursement disparity was a critical problem and threatened the financial viability of the hospital situation The interventions eventually produced positive results by achieving quantified cost reductions and enhancing understanding among participants

Action research is also signified by the evaluation and control criteria for the project as well as the manner in which the researcher(s) interact and respond to the expectations of the clients. Our evaluation criterion incorporates action research characteristics outlined by Susman and Evered (1978) and Baskerville (1999a). In addition, the overarching principles for conducting interpretative research suggested by Klein and Myers (1999) are incorporated into our study approach. Finally, the control structures desirable in conducting of this action research study as outlined by Avison et al. (2001) were considered. Of the two authors, one was an action researcher employed by the parent organization of SJHS. This action researcher intervened and collaboratively worked with participants who set the direction of the project. Consistent with the above guidelines, this action researcher interacted with clients and responded to their needs by actively participating in the problem situation. Based on past work with the key actors, this action researcher had established trust with all constituencies of actors involved in the project. The other author and action researcher was a process and organizational control research specialist. Both authors regularly conferred with each other. Collaboration and observation alongside the participants yielded an actionable solution to a critical problem faced by the organization.