

A SOCIAL CAPITAL MODEL OF HIGH PERFORMANCE WORK SYSTEMS

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In this paper we explore a causal mechanism through which high performance work systems influence performance outcomes. We propose a model in which a particular type of high performance work system – a relational work system – enhances organizational performance by creating a framework that encourages the development of social capital between employees who perform distinct functions. In a nine-hospital study of patient care, we show that the adoption of a relational work system predicts high levels of social capital among doctors, nurses, physical therapists, social workers and case managers in the form of relational coordination, in turn predicting quality and efficiency outcomes for patients. Results suggest that this social capital model of high performance work systems is a promising counterpart to models that focus on employee skills or commitment, and further suggest the potential for relational work systems to recognize and support the interdependent nature of work.

(146 words)

INTRODUCTION

One of the core principles of human resource management is that the way employees are managed is reflected in an organization's performance. In support of this argument, certain sets of human resource practices have been found to improve employee effectiveness (Pfeffer and Veiga 1999) and to predict higher levels of organizational performance (Ramsey Scholarios and Harley 2000; Bailey Berg and Sandy 2001; see also reviews by Becker and Gerhart 1996; Ichniowski Kochan Levine Olson and Strauss 1996). Researchers have documented the impact of human resource practices on efficiency outcomes such as worker productivity (Bartel 1994; Arthur 1994; Koch and McGrath 1996; Datta Guthrie and Wright 2005) and equipment reliability (Youndt Snell Dean and Lepak 1996; Ichniowski Shaw and Prensushi 1997), on quality outcomes such as manufacturing quality (MacDuffie 1995) and patient mortality (West et al 2002), on financial performance (e.g. Huselid 1995; Delery and Doty 1996; Collins and Smith 2006) and on broader sets of performance outcomes (Bartel 2004; Wright Gardner and Moynihan 2006), even impacting firm survival (Welbourne and Andrews 1996). Along with occasional studies finding no impact of human resource practices on performance (e.g. Cappelli and Neumark 2001), human resource practices have been found to explain performance differences among steel finishing lines (Ichniowski Shaw and Prensushi 1997), call centers (Batt 1999), airlines (Gittell 2001), banks (Richard and Johnson 2004) and high technology firms (Collins and Clark 2003).

Multiple labels have been applied to this basic argument, including high performance work systems, high commitment work systems, high involvement work systems and high performance human resource management. Despite these different labels, there is a common thread in the underlying arguments; organizations can achieve high performance by adopting practices that recognize and leverage employees' ability to create value. Though some disagreement remains among researchers, it is generally agreed that these practices include selection, training, mentoring, incentives, and knowledge-sharing mechanisms (Horgan and Muhlau 2006), and that these practices are more effective when they are implemented in bundles (MacDuffie 1995; Dunlop and Weil 1996; Ichniowski Shaw and Prensushi 1997; Batt 1999; Laursen 2002).

There is less resolution regarding the causal mechanisms through which high performance work systems influence performance outcomes. The two dominant arguments are based on human capital and skill on the one hand, and motivation and commitment on the other hand. But there is an emerging view that social capital and networks constitute a third causal mechanism through which high performance work systems influence performance outcomes (Delery and Shaw 2001). Rather than focusing primarily on the knowledge and skills of employees or on the commitment of employees to their organization, this third model focuses primarily on *relationships between employees* as the causal mechanism between high performance work systems and performance (e.g. Collins and Clark 2003; Collins and Smith 2006). In some respects, this social capital model has evolved out of the commitment model, which has increasingly viewed commitment as strengthening employee/employee connections in addition to strengthening employee connections to their organization (e.g. Tsui Pearce Porter and Tripoli 1997; Leana and Van Buren 1999).

The emergence of this social capital model suggests the potential for high performance work systems to recognize and support the interdependent nature of work, which has typically been neglected in the strategic human resource management literature. In this paper we propose a high performance work system in which each component work practice reaches across multiple functions to engage employees in a coordinated effort. All of the high performance work practices identified in this study are focused on building employee-to-employee relationships. We label them relational work practices to flag this characteristic and argue that together they form a relational work system. This relational work system is argued to activate the social capital that is latent in organizations into relational coordination, a form of social capital that is useful for the purpose of task integration.

We test our model with multi-level data from a nine-hospital study of patient care including administrator interviews to measure work practices, care provider surveys to measure relational coordination, and patient surveys to measure patient outcomes. We explore the effects of relational work systems on quality and efficiency outcomes for patients, and the mediation of these effects through relational coordination among care providers. Hospitals are notorious for operating with well-defined

silos with turf battles between them. Building relational coordination in a hospital setting thus provides a robust test of our model whose results can be utilized in less complex institutions.

Alternative Theories of High Performance Work Systems

Theories of high performance work systems often draw upon human capital theory. A central implication of human capital theory is that human resource practices can improve organizational performance by increasing the knowledge and skills of employees (Becker 1975). To be successful, firms must invest in and maintain the workforce just as they invest in and maintain the capital infrastructure. Researchers have found that companies can achieve sustained performance advantages by leveraging the knowledge of their employees. High performance work systems can foster the development of human capital in the form of firm-specific idiosyncratic skills (Gibbert 2006), creating a performance advantage for organizations (e.g. Freid and Hisrich 1994; MacMillan Zemann and Subbanarasimha 1987; Tyebjee and Bruno 1984) through processes such as increased employee problem solving (Snell and Dean 1992), and improved customization by employees in service industries (Batt 2002).

An alternative theoretical perspective is that high performance work systems work by enhancing the motivation and commitment of employees. High performance work systems transform employees from being merely employees into being partners for achieving organizational goals through use of human resource practices that draw on employee commitment, involvement and empowerment (Caspersz 2006). Commitment-based human resource practices create an organizational climate that motivates employees to act in the best interest of the organization, thus enhancing performance (Osterman 1988; Lawler 1988; Arthur 1992; Mahoney and Watson 1993; Rousseau 1995; Tsui Pearce Porter and Hite 1995; Appelbaum Bailey Berg and Kalleberg 2000). A key argument in this literature is that human resource practices build a psychological contract by signaling commitment to a long-term relationship by the employer, in turn yielding long-term commitment from the employee (Tsui Pearce Porter and Tripoli 1997). Consistent with this argument, studies have found that particular work practices are associated with increased employee control over work, increased employee involvement and higher levels of commitment (e.g. Tsui Pearce Porter and Tripoli 1997; Whitener 2001), and that these behaviors in turn

are positively associated with performance (e.g. Rosenberg and Rosenstein 1980; Estrin Jones and Svejnar 1987; Tomer 2001). In particular, Bowen and Ostroff (2004) provide evidence suggesting that motivation and discretionary effort underlie the relationship between human resource practices and performance, and are triggered by a strong human resource system. Even when the intermediate mechanism of control, involvement or commitment is not measured, it has often been theorized to explain the observed relationship between work practices and performance outcomes (e.g. Ichniowski Shaw and Prensushi 1997).

Increasingly, the commitment model of high performance work systems has evolved beyond the argument that work practices can inspire employee commitment to the organization, to argue that work practices can also strengthen employee/employee connections. For example, Tsui and co-authors (1997) found that when employers invest in employees through human resource practices, employees are likely to perceive that their obligations include working on job assignments that fall outside of prior agreements or expertise, assisting junior colleagues, learning organization-specific skills, and being willing to consider the unit's or the organization's interests as important as core job duties. Collins and co-authors (Collins and Clark 2003; Collins and Smith 2006) have theorized explicitly that human resource practices inspire commitment, and that commitment then motivates employees to build networks that produce value for the organization.

This development suggests a third theoretical model for high performance work systems in which employee/employee relations serve as the causal mechanism between work practices and performance outcomes. To further develop insights about the ability of high performance work systems to foster relationships between employees, we turn to the concept of social capital.

Social Capital Theories of High Performance Work Systems

Social capital is “the aggregate of the actual or potential resources which are linked to possession of a network of more or less institutionalized relationships of mutual acquaintance and recognition” (Bourdieu 1986), or more simply, an asset that adheres in social relations and networks (Leana and Van Buren 1999). Although the concept of social capital has a wide array of applications (see Adler and

Kwon 2002 for a review), organizational social capital is the type of social capital that exists in and can be developed by organizations as a distinctive organizational capability and source of competitive advantage (Nahapiet and Ghoshal 1998; Leana and Van Buren 1999). Organizational social capital improves performance by enabling employees to access the resources that are embedded within a given network (Seibert Kraimer and Liden 2001), and by facilitating the transfer and sharing of knowledge (Nahapiet and Ghoshal 1998; Tsai and Ghoshal 1998; Levin and Cross 2004; Leana and Pil 2006).

Other theorists have suggested the importance of organizational social capital for coordinating work (Faraj and Sproull 2000; Gittell 2000; Adler and Kwon 2007), based on the argument that coordination is the management of task interdependence and is thus a fundamentally social process (Weick and Roberts 1993; Faraj and Sproull 2000; Gittell 2002). According to the theory of relational coordination, coordination that occurs through frequent, high quality communication supported by relationships of shared goals, shared knowledge and mutual respect enables organizations to better achieve their desired outcomes. The relational dimensions give relational coordination high levels of bandwidth or information processing capacity, making it particularly relevant for coordinating work that is highly interdependent, uncertain and time-constrained. As argued previously (Gittell 2006), the relational dimensions of relational coordination are mutually reinforcing with the communication dimensions. Defined as “a mutually reinforcing process of interaction between communication and relationships carried out for the purpose of task integration” (Gittell 2002: 301), relational coordination is a form of social capital that is useful for coordinating work.

Substantial progress has been made toward identifying the work practices through which organizations influence the formation of social capital. Leana and Van Buren (1999) argued that stable employment relationships and reciprocity norms can facilitate the formation of social capital among employees. Evans and Davis (2005) developed a model suggesting that high performance work systems influence multiple dimensions of an organization’s social structure, including the development of bridging ties, norms of reciprocity, shared mental models, role making and organizational citizenship behavior. Gittell (2000) argued that human resource practices can be re-designed to foster relational

coordination among employees who are engaged in a common work process. When carried out consistently across work practices, this form of redesign is argued to result in a high performance work system that is amenable to the development of working relationships. Gittell showed that these redesigned work practices, including selection, conflict resolution, performance measurement, job design, supervision and boundary spanner roles predicted significantly higher levels of relational coordination among airline employees, though their impact on performance was not explored.

Similarly, Gant, Ichniowski and Shaw (2002) argued that human resource practices influence performance outcomes because they influence the social networks of production employees and the patterns of interaction through which work gets done. They showed that on steel finishing lines with high performance work systems, defined as selection, training, incentive pay, job design, problem solving teams, and extensive labor/management communication, production employees have denser communication networks with each other, and that these steel finishing lines also exhibit higher performance measured in terms of fewer delays and higher yields. Their results suggest that social capital may mediate the link between high performance work practices and outcomes, though mediation was not demonstrated. Lopez, Peon and Ordas (2005) argued that high performance work practices encourage employees to engage in collective learning, resulting in increased multi-disciplinary knowledge and thereby contributing to firm performance. They showed that selection, training, incentive pay and participation in decision-making contribute to organizational learning, which in turn contributes to firm performance, though again, mediation was not demonstrated.

Collins and Clark (2003) have provided one of the best empirical tests to date of the argument that human resource practices influence outcomes through their impact on social capital. They argued that the social networks of top management teams provide a source of competitive advantage because they enhance the firm's information-processing capability, and that human resource practices, including mentoring, incentives and performance appraisals, can be designed to encourage the development of these social networks. They then demonstrated that the impact of these high performance practices on firm performance is mediated by the strength of firms' top management team social networks.

More recently, Vogus (2006) argued that that high performance work practices such as selection, training, performance appraisal, performance-based rewards and job security contribute to high quality interactions and mindfulness by signaling to employees the importance of relationships, and that these high quality interactions contribute to higher quality outcomes for patients, particularly patient safety. Vogus demonstrated that the impact of these high performance practices on patient safety outcomes is mediated by the quality of interactions and mindfulness among the nursing staff on hospital units. A new paper by Sun, Aryee and Law (2007) provides additional theorizing regarding social capital models of high performance work systems as well as a rigorous empirical test. They show that organizational citizenship behavior, which is portrayed as a type of relational process, mediates the relationship between high performance human resource practices and both productivity and turnover.

Though the forms of social capital explored in these empirical studies are varied, including relational coordination (Gittell 2000), communication networks (Gant Ichniowski and Shaw, 2002; Collins and Clark 2003), collective learning (Lopez Peon and Ordas 2005), mindful interacting (Vogus 2006) and organizational citizenship behavior (Sun Aryee and Law 2007), together these studies suggest an alternative model of high performance work systems in which work practices influence organizational outcomes by helping to build social capital between employees.

From High Performance Work Systems to Relational Work Systems

The work practices found in these studies resemble in many ways the work practices found in the earlier high performance work systems literature – they include selection, training, performance measurement, rewards, knowledge-sharing mechanisms and so on – but they differ in an important way. The work practices found in these studies are conceptualized as fostering relationships among employees. This new understanding of high performance work systems is consistent with a long standing argument by post-bureaucracy theorists that traditional work practices often create divisions between employees even when relationships are critically important due to the need for coordination (e.g. Piore 1992; Heckscher 1994). According to Piore, the bureaucratic organizational practices that have become widespread through the rise of Taylorism “have pushed us to restrict communication among the people

responsible for the way in which the different parts are performed” (1992: 20). Heckscher envisions a post-bureaucratic, interactive organizational form in which “everyone takes responsibility for the success of the whole” and in which “workers need to understand the key objectives in depth in order to coordinate their actions intelligently ‘on the fly’” (1994: 24-25). Rather than rejecting the role of formal work practices, however, as the post-bureaucratic literature has tended to do, we argue that formal work practices can be redesigned explicitly to foster the relationships of shared goals, shared knowledge and mutual respect through which work can be effectively coordinated ‘on the fly.’ Our conceptualization of relational work practices is shown in the final column of Figure 1, suggesting both similarities and differences from previous conceptualizations.

[Insert Figure 1 about here.]

Our relational work practices include some traditional kinds of human resource practices that have been redesigned to support employee/employee relationships, for example selection for cross-functional teamwork and rewarding employees for contributions to cross-functional goals. Our relational work practices also include practices that have traditionally been outside the purview of human resource management including knowledge sharing mechanisms (e.g. Horgan and Muhlau 2006) such as cross-functional team meetings and cross-functional boundary spanner roles. Our relational work practices also include cross-functional conflict resolution, which has typically been neglected in studies of high performance work systems even though its potential relevance for supporting employee/employee relationships is apparent.

Other relational work practices that are typically outside the purview of human resource management include cross-functional performance measurement and improvement programs. While some have argued for the relevance of quality improvement practices such as TQM to human resource management (e.g. Appelbaum and Batt 1993; Kochan Gittel and Lautsch 1995), these practices are not typically included as elements of high performance work systems. While these practices do not aim to measure and improve the performance of individuals, they do aim to measure and improve the performance of broader processes, and can do so in ways that either solidify divisions between employees

in different functional roles or build relationships of shared goals, shared knowledge and mutual respect. Training and mentoring are two practices that are typically included in high performance work systems that are not considered in the current study, though they too have the potential to be redesigned as relational work practices that support employee/employee relationships.

We call these *relational work practices* to recognize that they are distinct from conceptualizations of high performance work practices that focus more on worker skills or commitment than on relationships between employees. Because these work practices are expected to have an additive impact on the development of employee/employee relationships and thus are expected to be more effective when they are adopted in sets or bundles, these relational work practices together form a *relational work system*. Similar to other types of high performance work systems, organizations with relational work systems can improve performance either by increasing the number of practices they employ within the system or by using the practices within the system in a more comprehensive and widespread manner (Youndt Snell Dean and Lepak 1996).

Relational work systems are expected to influence performance outcomes through their positive effect on relational coordination. In other words, increased levels of relational coordination explain or mediate the relationship between relational work systems and performance outcomes. Relational work systems are expected to foster the development of relational coordination by activating the social capital that is already latent in organizations but that is likely to be fragmented across functional boundaries, into a form that is suitable for coordinating interdependent work.

Hypothesis 1: The adoption of relational work systems is positively related to the development of relational coordination among employees.

Through their impact on relational coordination, relational work systems are expected to improve quality outcomes for organizations. Relational coordination among employees generates rapid, accurate and consistent responses to new information as it emerges, with the result of minimizing both errors and customer uncertainty, particularly in service settings where the customer participates directly in the work process.

Hypothesis 2a: The adoption of relational work systems is positively related to quality outcomes.

Hypothesis 3a: The effect of relational work systems on quality outcomes is mediated by relational coordination among employees.

Through their impact on relational coordination, relational work systems are also expected to improve efficiency outcomes for organizations. Relational coordination among employees reduces the time that is wasted carrying out redundant communication, searching for missing information and waiting to hear from others, resulting in more efficient utilization of organizational resources.

Hypothesis 2b: The adoption of relational work systems is positively related to efficiency outcomes.

Hypothesis 3b: The effect of relational work systems on efficiency outcomes is mediated by relational coordination among employees.

These hypotheses together serve as the basis for a relational model of high performance work systems, illustrated in Figure 2.

[Insert Figure 2 about here.]

METHODS

Setting

To test these hypotheses, a study of patient care was conducted using a convenience sample of nine major urban hospitals. We chose a work process for which outcomes were well understood and readily measured – surgical care for joint replacement patients. We selected nine orthopedics units, each located in a separate hospital, which performed relatively large numbers of joint replacements, in order to secure an adequate sample of patients in a short period of time. In each orthopedics unit, there was a group of care providers, including physicians, nurses, physical therapists, case managers and social workers, who were responsible for providing care to joint replacement patients.

Data Sources

Data from the nine participating orthopedics units included administrator interviews, a care provider survey, a patient survey and patient hospitalization records. Administrator interviews were used to measure high performance work practices at the level of the orthopedics unit. The care provider survey

was used to measure relational coordination at the level of individual care providers. Individual patient surveys and hospitalization records were used to measure performance outcomes at the level of individual patients.

To measure work practices, front-line administrators were interviewed in each of the nine orthopedics departments, including at least one physician, nurse, physical therapist, social worker and case manager. For each unit, unstructured interviews and observations were conducted in person at the time of the initial site visits, followed up by more systematic structured interviews after the site visits by phone. The interview protocol that we developed based on our first stage of interviews and observations was used as a guide for our second stage of interviews. Because research has shown that individual high-level administrators are unreliable raters of specific practices (Wright Gardner et al 2001), administrators were selected for interviews from within the unit where the work practices were implemented. Interviews were carried out by the first and third authors on this paper, then the coding was carried out by the first author on this study in consultation with the third author. Statements like “usually,” or “some of us,” or “I look for” were coded as “teamwork ability was considered to some extent,” for example, while a statement such as “this is how we do it here” was coded as “teamwork ability was a consistent criterion for selection.” When we received conflicting reports from the same site, interviewees were re-contacted for clarification.

To measure relational coordination, surveys were mailed to all eligible care providers in the nine orthopedics units who had responsibilities for joint replacement patients during the study period, in five core functions: physicians, nurses, physical therapists, social workers and case managers. A unit administrator designated by the chief of orthopedics identified all eligible care providers in each unit. The administrator was supplied written guidelines as to whom should be included (all providers from the above five functions who were directly or indirectly involved with providing care for joint replacement patients). Surveys were mailed to all eligible care providers initially during the second month of the study period, with one repeat mailing during the study period for non-respondents. Responses were received from 338 of 666 providers for an overall provider response rate of 51%.

To measure patient outcomes, the patient survey was adapted from a validated instrument that is widely used to assess the quality of care in healthcare settings (Cleary et al 1991). We received responses to 878 of 1,367 questionnaires sent to patients in the target population, for a response rate of 64%. In addition, hospitalization records were obtained for each patient from hospital administrators. These records were used to determine length of stay for each patient, and to extract information regarding patient characteristics to use as control variables in models of quality and efficiency outcomes.

Relational Work Systems

The relational work practices measured for this study included selection for cross-functional teamwork, rewards for cross-functional teamwork, cross-functional performance measurement, cross-functional conflict resolution, cross-functional team meetings and cross-functional boundary spanners. The scaling for each measure was determined during the coding process based on the degree of differentiation we were able to make given the information we had collected in the interview notes. Perhaps because performance measurement was a perceived problem area in our hospitals at the time, we tended to get longer, more detailed discussions of this issue, both with respect to quality assurance and utilization review, enabling us to construct more finely grained measures, as indicated below. Descriptive data for these work practices are shown in Table 1.

Selection for cross-functional teamwork was measured by asking administrators in each orthopedics unit about selection criteria for physicians, nurses and physical therapists, probing as to whether teamwork ability was considered an important selection criterion. This variable was coded from 0 to 2 for each of these three workgroups, 0 indicating that teamwork ability was not considered, 1 indicating that it was considered to some extent, and 2 indicating that it was a consistent criterion for selection. Statements like “usually,” or “some of us,” or “I look for” were interpreted to mean “teamwork ability was considered to some extent,” while a statement such as “this is how we do it here” was interpreted to signify that “teamwork ability was a consistent criterion for selection.”

Rewards for cross-functional teamwork were measured by asking about the criteria for rewards for physicians, nurses and physical therapists, probing as to whether rewards were based purely on

individual performance or if they were based on some team criteria as well. This variable was coded from 0 to 2. For physicians, 0 indicated individual rewards only, 1 indicated surplus sharing with the hospital and 2 indicated risk sharing with the hospital. For nurses and physical therapists, 0 indicated no rewards, 1 indicated individual rewards only, and 2 indicated some team rewards. *Cross-functional conflict resolution* was measured by asking about conflict resolution processes, probing as to whether any formal conflict resolution process was in place for physicians, nurses or physical therapists. This variable was coded from 0 to 1 for physicians, nurses and physical therapists, where 0 indicated that the workgroup had no access to formal cross-functional conflict resolution processes and where 1 indicated access.

Cross-functional performance measurement was measured by asking about the quality assurance process and the utilization review process in their hospital, probing as to whether each of these processes were largely focused on identifying the single function that was responsible for a quality or utilization problem, or whether there was a more cross-functional approach. These two variables were coded on a 1 to 5 scale, with 1 indicating a purely functional approach and 5 indicating a highly cross-functional approach. Interviewees were also probed as to whether these two performance measurement processes were largely reactive, focused on affixing blame, or proactive, focused on problem solving. These two variables were coded on a 1 to 5 scale, with 1 indicating a purely reactive, blaming focus and 5 indicating a highly proactive problem-solving focus.

Cross-functional team meetings were measured by asking key informants about participation in physician rounds and nursing rounds, probing to find out which functional groups participated in those rounds and the frequency of their participation. These variables were coded on a 0 to 2 scale, with 0 indicating that the workgroup did not participate in the rounds, with 1 indicating that they participated sometimes, and with 2 indicating that they participated usually or always. *Cross-functional boundary spanner* was measured by asking about the caseload and roles of the case managers who worked with joint replacement patients, and whether the primary nursing model was in place on that unit, providing a second boundary spanner role. Primary nursing is the practice of assigning one nurse to assume primary

responsibility for a patient throughout his or her stay, contributing to coordination by designating a point person among nurses for each patient. Caseload was measured as a continuous variable, while each of the case manager roles – leadership of rounds and planning for patient discharge – were coded as 0 to 1, with 0 indicating that the role was not expected and 1 indicating that the role was expected of case managers. Primary nursing was coded as 1 if the model was in place and 0 if it was not.

Together, these relational practices can be conceptualized as forming a *relational work system*. Exploratory factor analysis suggested that relational work systems can be characterized fairly well as a single factor. Nineteen of the original 23 items had factor 1 loadings greater than 0.40 and were retained: selecting physicians for teamwork 0.701, selecting nurses for teamwork 0.760, selecting physical therapists for teamwork 0.570; rewarding physicians for teamwork 0.438, rewarding nurses for teamwork 0.560, rewarding physical therapists for teamwork 0.803; cross-functional conflict resolution for physicians 0.916, for nurses 0.700, for physical therapists 0.438; cross-functional approach to quality measurement 0.544, problem-solving approach to quality measurement 0.729, problem-solving approach to utilization review 0.834; nurses included in physician rounds 0.548, physical therapists included in physician rounds 0.691, case managers included in physician rounds 0.677; case manager caseload - 0.740, case manager role in leading rounds 0.642, case manager discharge planning role 0.515 and primary nursing model 0.746. Four items with loadings less than 0.40 were dropped, including cross-functional approach to utilization review (1 item), participation in nursing rounds (2 items) and coordination role for case managers (1 item). The eigenvalue for factor 1 was 8.53, while the eigenvalue for factor 2 was 3.08.

Checking for cross-loadings, we found that 6 of the 19 variables in the relational work system also loaded onto factor 2 with loadings of .40 or higher, suggesting that our index has only a moderate degree of discriminant validity. All items had item-to-total correlation scores of .40 or greater, suggesting that our index meets standards for convergent validity. An additive scaling method was used in which each item that loaded onto factor 1 with loading of 0.40 or more was standardized with a mean of zero and a standard deviation of one so that each item in the relational work system index was equally

weighted. A joint test for skewness and kurtosis indicated that normal distribution of the relational work system cannot be rejected (chi square 2.01, prob(chi square) = 0.3654). Cronbach's alpha for the relational work system index was 0.92, suggesting that this construct has a high level of internal validity (Nunnally 1978).

Why have we selected an additive rather than multiplicative approach for aggregating elements of relational work systems into an index? As argued by Youndt et al (1996), "the additive approach to combining HR practices into an index suggests that firms can improve performance either by increasing the number of practices they employ within the system or by using the practices in an HR system in a more comprehensive and widespread manner. This approach is conceptually and empirically preferable to a multiplicative approach to creating HR systems because it does not reduce the index value to zero if a single HR practice is absent from a system. Instead, the absence of a practice only weakens the net effect of the system (MacDuffie 1995; Osterman 1994)." Relative to a multiplicative approach, an additive approach is more comprehensive, withstands missing human resource practices and reflects the entire gestalt (Delery 1998; Youndt et al 1996; Becker and Gerhart 1996). Moreover, additive models assume each practice is equally important within the index, an appropriate assumption for our study given that we have offered no hypotheses that indicate otherwise. A multiplicative approach is more appropriate when the practices together are expected to add up to more than the sum of the individual practices due to their fit with each other. Although this may be the case with the practices in a relational work system, the theoretical construct as developed thus far does not include explicit arguments regarding fit.

As we see from the data in Table 1, the work systems in this study do not treat all types of workers the same. The work system experienced by workers in these hospital units is one in which different types of workers are treated differently. Though we do not focus on it in this paper, the consistency of a work system with respect to its treatment of different types of workers is another way to conceptualize and measure work systems.

[Insert Table 1 about here.]

Relational Coordination

As described above, relational coordination is a form of social capital that is useful for the purpose of task integration and therefore is particularly relevant in settings where work is divided among multiple functions, each with a set of distinct specialized tasks. Relational coordination was measured using the survey of care providers. The questions reflected the seven dimensions of relational coordination: the frequency, timeliness, accuracy and problem-solving nature of communication among those providers, and the degree to which their relationships were characterized by shared goals, shared knowledge and mutual respect.

Items included the following: “How frequently do you communicate with each of these groups about the status of joint replacement patients?” “Do people in these groups communicate with you in a timely way about the status of joint replacement patients?” “Do people in these groups communicate with you accurately about the status of joint replacement patients?” “When an error has been made regarding joint replacement patients, do people in these groups blame others or share responsibility?” “To what extent do people in these groups share your goals for the care of joint replacement patients?” “How much do people in these groups know about the work you do with joint replacement patients?” and “How much do people in these groups respect you and the work you do with joint replacement patients?” Respondents from each of the five functions believed to be most central to the care of joint replacement patients – physicians, nurses, physical therapists, social workers and case managers – were asked to answer these questions with respect to each of the other functions. Responses were captured on a 5-point Likert-type scale.

Exploratory factor analysis suggested that relational coordination is best characterized as a single factor with the following factor loadings: frequent communication 0.566, timely communication 0.782, accurate communication 0.796, problem-solving communication 0.784, shared goals 0.629, shared knowledge 0.629, and mutual respect 0.659. The eigenvalue for this factor was 3.41, while the eigenvalue for factor 2 was 0.55. An additive scaling method was used in which each item was standardized with a mean of zero and a standard deviation of one so that each item was equally weighted. Cronbach’s alpha was 0.86, suggesting that this construct has a high level of internal validity (Nunnally

1978). No items were dropped due to weak factor loadings, and no cross-loadings greater than 0.40 were found. Furthermore, all items had item-to-total correlation scores of 0.40 or greater. We conclude therefore that the relational coordination index meets standards for internal validity, discriminant validity and convergent validity.

Using one-way analysis of variance, significant cross-unit differences in relational coordination were found ($F = 5.32, p < 0.0001$), and also significant cross-functional differences in relational coordination ($F = 2.89, p = 0.0142$). When unit-level and function-level differences were considered jointly, unit-level differences remained significant ($F = 4.51, p < 0.0001$), while function-level differences became insignificant ($F = 1.75, p = 0.1218$). The intra-class correlation for relational coordination was significantly greater than zero ($p < 0.05$). Taken together, these results are consistent with treating relational coordination as a unit-level construct. Relational coordination measures are summarized at the bottom of Table 1.

Patient Performance Outcomes

Measures of performance for this study included both the quality and efficiency of patient care, measured for individual joint replacement patients. Believed to affect customer loyalty and likelihood to recommend, hospitals are interested in improving the quality of care as perceived by patients (Cleary et al 1991). Accordingly, all hospitals in this study had been conducting patient surveys for several years, though differences among the existing surveys required them to adopt a new patient survey for the purpose of this study. Based on its high correlation with a more complex multi-item index of patient satisfaction, a single item measure of patient-perceived quality of care was used in the analyses conducted here (“Overall, how would you rate the care you received at the hospital?”), measured on a 5-point Likert-type scale.

Hospitals have also been striving to improve the efficiency of care by reducing patient lengths of stay. Length of stay is the number of inpatient days of care utilized by a given patient. Days of inpatient care are a resource that external payers are intent on reducing. This study therefore uses the length of hospital stay as a measure of the efficiency of care for each individual patient, controlling for the patient

characteristics that are believed to necessitate longer lengths of stay. Length of stay was calculated from hospital records for each patient as the number of whole days between the date of admission and the date of discharge.

Control Variables for Relational Coordination Models

Control variables for the relational coordination model include dummy variables that indicate the functional identity of the care provider respondent (physician, nurse, therapist, case manager, social worker), given that different functions are expected to engage differently in relational coordination due to differences in their professional identities. In particular, we expect physicians to be less engaged in relational coordination than other members of the care provider team, given that their professional identity has traditionally been oriented toward autonomous action (Wicks 1998; Adler and Kwon 2007). Ideally this model would include other demographic characteristics such as tenure and gender that might influence care provider engagement in relational coordination; however these variables were not included on the survey. In addition to functional identity of respondents, the volume of total joint replacements conducted by each unit in the six-month period prior to the study period was included to control for possible learning or scale effects (Luft 1990).

Control Variables for Quality and Efficiency Outcome Models

Control variables for the quality and efficiency outcome models were selected to adjust for factors that have been shown in the healthcare literature to affect quality of care and length of stay for joint replacement patients. Control variables used for risk-adjustment included the following patient characteristics: patient age, comorbidities, psychological wellbeing, pre-operative status, surgical procedure (hip versus knee replacement), marital status, race and gender.

Patient age was determined from hospital records. Older patients were expected to require longer hospital lengths of stay. Pre-operative clinical status was assessed in the patient survey using the pain and functioning elements of the WOMAC instrument (Bellamy et al 1988). Patients with lower pre-operative status were expected to require longer lengths of stay. Comorbidities were assessed in the patient survey with a series of questions asking patients whether they suffered from heart disease, high blood pressure,

diabetes, ulcer or stomach disease, kidney disease, anemia or other blood disease, cancer, depression or back pain (Katz et al 1996). Individual patients with a greater number of comorbid conditions were expected to require longer hospital lengths of stay. Surgical procedure was measured through procedure code in the hospital record and was either a hip or a knee replacement. Knee replacements were expected to require longer lengths of stay, due to greater difficulty of achieving post-operative mobility.

Psychological wellbeing was assessed in the patient survey using the mental health component of the SF-36 (Stewart Hayes and Ware 1988). Patients with higher levels of psychological wellbeing were expected to report receiving higher quality of care: psychological theory suggests that people with high levels of positive affect tend to perceive experiences in a more favorable light. Patient gender, race and marital status were determined through the patient survey and were included in performance models because some studies have found demographic influences on healthcare outcomes. In addition to patient characteristics, the volume of total joint replacements conducted by each unit in the six-month period prior to the study period was included to control for possible learning or scale effects (Luft 1990).

Data Analyses

To test *Hypothesis 1*, we regressed relational coordination (n = 336 care providers in 9 units) on the relational work system index (n = 9 units), controlling for the functional identity of the care provider respondents (with nurse as the omitted respondent category) and for the volume of joint replacements conducted on the unit in the six-month period prior to the study. To test *Hypotheses 2a* and *2b*, we regressed quality outcomes (n = 588 patients in 9 units) and efficiency outcomes (n = 599 patients in 9 units) on the relational work system index (n = 9 units), controlling for the patient characteristics expected to affect these outcomes as well as the volume of joint replacements conducted on the unit in the six-month period prior to the study.

To test *Hypotheses 3a* and *3b*, we aggregated relational coordination to the unit level (n = 9 units) and entered it along with the relational work system index (n = 9 units) into the above equations for quality outcomes (n = 588 patients in 9 units) and efficiency outcomes (n = 599 patients in 9 units). If the coefficient on relational work systems becomes insignificant when relational coordination is added to the

outcomes equations, this result can be taken to suggest that relational coordination mediates between relational work systems and outcomes, or in other words that relational work systems influence outcomes through their effect on relational coordination (Baron and Kenney 1986).

For all of the above equations, random effects modeling was used to adjust standard errors for the multi-level nature of the data, accounting for non-independence of the error terms (Bryk and Raudenbusch 1992). Due to its skewness, length of stay was transformed for zero skewness using LNSKEW0 in STATA before being included in our models. We report within-unit and between-unit R^2 to indicate the percent of within-unit and between-unit variation that is explained by each equation. To facilitate the interpretation of regression coefficients, all variables were standardized with a mean of 0 and a standard deviation of 1 before being entered into the regression equations.

FINDINGS

Descriptive data are reported in Table 2 in aggregate form, and in Table 3 are broken out by individual hospital unit. Due to the high correlation found between relational work systems and relational coordination, we tested for multicollinearity in the outcomes models that include both relational work systems and relational coordination as independent variables by examining variance inflation factors. According to Chatterjee and Price (1991), evidence of multicollinearity exists if 1) the largest variance inflation factor is greater than 10 though some choose a more conservative threshold value of 30 or 2) the mean value of all the variance inflation factors is considerably larger than 1. We found that the variance inflation factors for the quality of care model ranged from 1.06 to 8.45 with an average variance inflation factor of 2.46, and for the length of stay model they ranged from 1.06 to 8.50 with an average variance inflation factor of 2.47. Comparing our results to the Chatterjee and Price criteria, we conclude that multicollinearity is not likely to be a problem in our models.

[Insert Tables 2 and 3 about here.]

Relational Work Systems and Relational Coordination

To test *Hypothesis 1*, we assessed the association between relational work systems (n = 9 units) and relational coordination (n = 336 care providers in 9 units). Results are reported in Table 4.

Relational work systems are positively associated with relational coordination ($r = 0.27, p < 0.001$). As anticipated, physicians were less engaged in relational coordination than were nurses ($r = -0.21, p < 0.001$), but relational coordination for the other care provider groups did not differ significantly from that of nurses.

The estimated effect of relational work systems on relational coordination is statistically significant and moderately large. The coefficient of 0.27 on relational work systems suggests that for every standard deviation increase in relational work systems, a 0.27 standard deviation increase in relational coordination can be expected. The equations explain relatively little within-unit variation in relational coordination ($R^2 = 0.07$), but explain a large percentage of between-unit variation in relational coordination ($R^2 = 0.90$). These results provide strong support for our hypothesis that relational work systems support the development of relational coordination among employees (*Hypothesis 1*).

[Insert Table 4 about here.]

Relational Work Practices, Relational Coordination and Quality Outcomes

To test *Hypotheses 2a* and *3a*, we assessed associations between relational work systems ($n = 9$ units) and quality outcomes ($n = 588$ patients in 9 units). See Table 5 for results. Results in column 1 show that relational work systems are associated with higher risk-adjusted quality of care ($r = 0.25, p < 0.001$). When relational coordination is aggregated to the unit level and included in the equation (column 2), relational coordination is associated with higher risk-adjusted quality of care ($r = 0.26, p = 0.041$) while the coefficient on relational work systems becomes insignificant, suggesting mediation.

Again, the estimated effects are statistically significant and moderately large. The coefficient of 0.25 on relational work systems suggests that for every standard deviation increase in relational work systems, a 0.25 standard deviation increase in patient quality of care can be expected. The coefficient of 0.26 on relational coordination suggests that for every standard deviation increase in relational coordination, a 0.26 standard deviation increase in the quality of care can be expected. The equations explain little within-unit variation in quality of care ($R^2 = 0.05$), but explain a large percentage of between-unit variation in quality of care ($R^2 = 0.73$ for the most complete model). These results suggest

that relational work systems predict high quality outcomes (*Hypothesis 2a*), and that they do so by strengthening relational coordination among employees (*Hypothesis 3a*).

[Insert Table 5 about here.]

Relational Work Practices, Relational Coordination and Efficiency Outcomes

To test *Hypotheses 2b* and *3b*, we assessed associations between relational work systems (n = 9 units) and efficiency outcomes (n = 599 patients in 9 units). See Table 5 for results. Results in column 3 show that relational work systems are associated with shorter risk-adjusted lengths of stay ($r = -0.29$, $p < 0.001$). When relational coordination is aggregated to the unit level and included in the equation (column 4), relational coordination is associated with shorter risk-adjusted lengths of stay ($r = -0.40$, $p = 0.001$) while the coefficient on relational work systems becomes insignificant, suggesting mediation.

Once again, the estimated effects are statistically significant and moderately large. The coefficient of -0.29 on relational work systems suggests that for every standard deviation increase in relational work systems, a 0.29 standard deviation decrease in patient length of stay can be expected. The coefficient of -0.40 on relational coordination suggests that for every standard deviation increase in relational coordination, a 0.40 standard deviation decrease in the length of stay can be expected. The equations explain little within-unit variation in length of stay ($R^2 = 0.03$), but explain a large percentage of between-unit variation in length of stay ($R^2 = 0.82$ for the most complete model). These results suggest that relational work systems predict efficiency outcomes (*Hypothesis 2b*), and that they do so by strengthening relational coordination among employees (*Hypothesis 3b*). See Figure 3 for a summary of results.

[Insert Figure 3 about here.]

DISCUSSION

In this paper we explored a causal mechanism through which high performance work systems affect performance outcomes. We proposed a model in which high performance work systems enhance organizational performance by creating a framework that encourages the development of relational coordination between employees who perform distinct functions in the same work process. Instead of

focusing on how work practices shape individual worker attributes (such as skills or commitment), relational models of high performance work systems focus explicitly on how work practices strengthen or weaken employee relationships with other employees. The work practices expected to build relational coordination are work practices that encourage and reward collaboration among different functions, in contrast to traditional bureaucratic practices that divide and separate employees from one another. These work practices include selection for teamwork, rewards for teamwork, cross-functional performance measurement, cross-functional conflict resolution, cross-functional boundary spanners and cross-functional team meetings, and together they form a set of practices that we label a *relational work system*.

Contributions

This paper has made several key contributions. First, this paper has introduced the concept of task interdependence to the strategic human resource management literature, and more specifically to the high performance work systems literature. These insights increase the potential for high performance work systems to recognize and support the interdependent nature of work, a central theme in the organization design literature that has typically been neglected in the strategic human resource management literature.

Second, this study contributes to a relational theory of high performance work systems by introducing the concept of relational work systems. Traditional work practices were designed to segment and divide employees from their counterparts in different functions (e.g. Piore 1992; Heckscher and Donnellon 1994), an argument made compelling by post-bureaucracy theorists. These traditional bureaucratic work practices helped to foster distinct thought worlds (Dougherty 1992) and arguably also helped to strengthen occupational communities (Van Maanen and Barley 1984). These practices can be redesigned to encourage the development of relationships between employees in different functions (e.g., Gittell 2000) by activating the social capital that is latent in organizations into a form that is suitable for coordinating work across functional role boundaries. Though some of the individual practices we have introduced are novel, our contribution is less the identification of novel work practices than the identification of relational work systems as a particular type of high performance work system.

A third contribution of this study has been to identify a specific role that social capital can play in high performance work systems. Building on the argument that social capital is latent in workplace relations, we have argued that a relational work system can be designed to trigger or activate that latent social capital into relational coordination, a role-based form of social capital that is useful for the purpose of task integration. Like Thompson's (1967) notion of mutual adjustment and Bechky's (2006) work on role-based coordination, relational coordination highlights interactions between role categories rather than among specific individuals. Relationships across role categories play a powerful role in coordination but are often neglected in favor of a focus on personal relationships among specific individuals. Relative to previous authors, the relational coordination construct makes more specific claims about the relational dimensions of effective role-based coordination. The dimensions captured by relational coordination include shared goals, shared knowledge and mutual respect, differing from the dimensions of relationship quality typically highlighted by network theorists by highlighting dimensions that are relevant for relationships between role categories. Relational coordination shares with heedful interrelating and respectful interacting a focus on the relational aspects of interaction (Weick and Roberts 1994, Vogus 2006). However, unlike heedful interrelating, respectful interaction and other similar forms of social capital, relational coordination is role-based and is specifically concerned with the coordination of work.

Of the existing models regarding human resource practices and social capital, Collins and Clark's (2003) model is the most similar to ours. They argue that human resource practices can foster social networks by using practices like "mentoring, incentives, and performance appraisals to encourage the development of business relationships" (p. 740). Like us they conceptualize social networks as mediators between human resource management and performance. Their human resource practices are similar to ours in their focus on relationship building, though they call them network-building human resource practices rather than relational work practices.

Our work differs from that of Collins and Clark both theoretically and methodologically. Theoretically, we focus on a specific form of social capital – relational coordination – that is useful for the purpose of task integration, rather than focusing on business relationships more generally.

Furthermore our theory building is focused at the level of direct service delivery rather than at the level of business relationships among top managers. Most importantly, we differ theoretically from Collins and Clark by identifying relational work systems as a distinctive type of high performance work system. Methodologically, we differ from Collins and Clark by using multiple data sets to test our hypotheses. While Collins and Clark interviewed CEOs to determine human resource practices, social networks and performance, thus introducing the potential for biases that can arise when relying on a single source of data, we interviewed front-line managers to determine human resource practices, surveyed direct service workers to determine social networks and examined customer data to determine performance outcomes.

Limitations

Despite its contributions, this study is limited in several ways. First, this study is limited by the use of interviews rather than survey instruments to measure work practices, rendering the results less amenable to replication due to the time-consuming process of conducting interviews and constructing variables. Secondly, our data are limited by the lack of measures for individual skill and commitment. We have counterbalanced this omission by arguing that social capital in the form of relational coordination is essential in this context and explaining how it is not readily captured by human capital or commitment, highlighting the interdependence of the work and the resulting need for relationships of shared goals (not just individual commitment) and shared knowledge (not just individual expertise) to reinforce the communication through which work is coordinated.

A third limitation of our data is the lack of employee level control variables other than the functional identity of the respondent. We have fairly extensive demographic information for our patient respondents but no demographics for the care providers who responded to our survey other than functional identity. The omission of care provider demographics from the model that predicts relational coordination among care providers may result in omitted variable bias. For example, gender may account for some of the negative association that we found between physician role identity and relational coordination. Finally, although our focus on role-based coordination differentiates our study and constitutes a contribution to the high performance work system literature, it is also a limitation of our

study. Our focus on role-based coordination misses some of the intra-functional relationships that may be important in some contexts, including healthcare delivery as shown by Vogus (2007).

Future Research

Next steps in theory development should include the development of high performance work system models that combine human capital, commitment and social capital. Others have begun to take steps in this direction. Smith, Collins and Clark (2005) developed a model that explores the contribution of human capital and social capital to perceived knowledge creation capability in technology firms, based on the argument that one without the other is not very useful. Leana and Pil (2006) developed and tested a similar model in the context of public schools. But neither has identified thus far the high performance work systems that would support the development of both human and social capital.

Though doing so was beyond the scope of the current paper given our focus on a system of work practices that encompassed multiple workgroups, relational coordination can be disaggregated to look separately at the different dyads as is commonly done with other network measures (e.g. Levin and Cross 2004). In another study that explored an experiment in physician job design, relational coordination ties between physicians and other workgroups were significantly and positively associated with the change in physician job design (Gittell Weinberg Bennett and Miller 2007). In future studies it may be relevant to focus on how the design of relational work systems influences not only the aggregate strength of cross-functional ties but also the differential strength of those ties, and with what implications for performance.

CONCLUSION

In conclusion, this study suggests that adoption of relational work systems constitutes one viable path for improved organizational performance. But organizations have other options when choosing paths for improving performance. What are the relative advantages of the relational approach explored here? The form of social capital explored here, relational coordination, enables employees to coordinate ‘on the fly,’ thus pushing out the production possibilities frontier to achieve higher quality outcomes while using resources more efficiently – for example, as we found here, enabling hospital workers to achieve higher patient quality of care along with shorter patient lengths of stay. This form of social

capital and the relational work systems that support its development are therefore particularly relevant in industries that must achieve quality outcomes while responding to cost pressures.

Secondly, unlike other forms of social capital that are based on personal ties, the form of social capital measured in this study – relational coordination – is based instead on ties between roles. The relational work system explored in this paper is designed to ensure that sufficient social capital exists among employees whose work is interdependent, with or without the presence of personal friendship ties. This feature allows for the interchangeability of employees, allowing employees to come and go without missing a beat, an important consideration for organizations that strive to achieve high levels of performance while allowing employees the scheduling flexibility to meet their outside commitments.

Finally, a relational work system may be more difficult to replicate than other kinds of high performance work systems. Whereas skills can be purchased through the labor market and even commitment may be purchased to some extent through individual incentives, relational coordination like other forms of social capital must be built collectively. Thus, while it is likely to be harder to achieve, the relational work system introduced here has the potential to provide organizations with a relatively sustainable source of competitive advantage.

REFERENCES

- Adler, P., S.W. Kwon. 2007. *The Evolving Organization of Professional Work*. Working Paper.
- Adler, P., S.W. Kwon. 2002. Social capital: Prospects for a new concept. *Acad. Mgt. Rev.* 27(1): 17-40.
- Appelbaum, E., T. Bailey, P. Berg, A.L. Kalleberg. 2000. *Manufacturing Advantage: Why High-Performance Work Systems Pay Off*. Ithaca, NY: ILR Press.
- Appelbaum, E., R. Batt. 1993. *The New American Workplace*. New York: ILR Press, Cornell.
- Argote, L. 1982. Input uncertainty and organization coordination in hospital emergency units. *Admin. Sci. Q.* 27: 420-434.
- Arthur, J.B. 1992. The link between business strategy and industrial relations systems in American steel minimills. *Indust. Labor Rel. Rev.* 45: 488-506.
- Arthur, J.B. 1994. Effects of human resource systems on manufacturing performance and turnover. *Acad. Mgt. J.* 37: 670-687.
- Bailey, T., P. Berg, C. Sandy. 2001. The effect of high-performance work practices on employee earnings in the steel, apparel, and medical electronics and imaging industries. *Indust. Labor Rel. Rev.* 54: 525-544.
- Bartel, A.P. 2004. Human resource management and performance outcomes: Evidence from retail banking. *Indust. Labor Rel. Rev.* 57: 181-203.
- Bartel, A.P. 1994. Productivity gains from the implementation of employee training programs. *Indust. Rel.* 33: 411-425.
- Baron, R., D.A. Kenny. 1986. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *J. Pers. Soc. Psych.* 51: 1173-1182.
- Batt, R. 2002. Managing customer services: Human resource practices, quit rates, and sales growth. *Acad. Mgt. J.* 45: 587-598.
- Batt, R. 1999. Work design, technology and performance in customer service and sales. *Indust. Labor Rel. Rev.* 52: 539-564.

- Becker, B., B. Gerhart. 1996. The impact of human resource management on organizational performance: Progress and prospects. *Acad. Mgt. J.* 39(4): 779-801.
- Becker, G.S. 1975. *Human Capital*. New York: Columbia University Press.
- Bellamy, N., W.W. Buchanan, C.H. Goldsmith, J. Campbell, L.W. Stitt. 1988. Validation study of the WOMAC: A health status instrument for measuring clinically-important patient relevant outcomes following total hip or knee joint replacement in osteoarthritis. *J. Ortho. Rheum.* 1: 95-108.
- Bordieau, P. 1986. The forms of capital. J. Richardson, ed. *Handbook of Theory and Research for the Sociology of Education*. Westport: Greenwood Press.
- Bowen, D.E., C. Ostroff. 2004. Understanding HRM-firm performance linkages: The role of the 'strength' of the HRM system. *Acad. Mgt. Rev.* 29: 203-221.
- Bryk, A.S., S.W. Raudenbush. 1992. *Hierarchical Linear Models: Applications and Data Analysis Methods*. Newbury Park: Sage Publications.
- Cappelli, P., D. Neumark. 2001. Do high performance work practices improve establishment level outcomes? *Indust. Labor Rel. Rev.* 54: 737-775.
- Caspersz, D. 2006. The 'talk' verses the 'walk': High performance work systems, labour market flexibility and lessons from Asian employees. *Asia Pacific Bus. Rev.* 12: 149-161.
- Chatterjee, S., B. Price. 1991. *Regression Analysis by Example*. New York: John Wiley and Sons.
- Cleary, P.D., S. Edgman-Levitan, M. Roberts, T.W. Moloney, W. Mullen, J.D. Walker. 1991. Patients evaluate their hospital care: A national survey. *Health Affairs*, 10: 254-267.
- Collins, C.J., K. Clark. 2003. Strategic human resource practices, top management team social networks, and firm performance: The role of human resource practices in creating organizational competitive advantage. *Acad. Mgt. J.* 46: 740-751.
- Collins, C., K. Smith. 2006. Knowledge exchange and combination: The role of human resource practices in the performance of high-technology firms. *Acad. Mgt. J.* 49(3), 544-560.
- Datta, D.K., J.P. Guthrie, P.M. Wright. 2005. HRM and labor productivity: Does industry matter? *Acad. Mgt. J.* 48(1), 135-145.

- Delery, J.E., J.D. Shaw. 2001. The strategic management of people in work organizations: Review, synthesis and extension. G.R. Ferris, ed. *Research in Personnel and Human Resource Management*. 20: 165-197. Greenwich, CT: JAI.
- Delery, J.E., D.H. Doty 1996. Modes of theorizing in strategic human resource management: Tests of universalistic, contingency, and configurational performance predictions. *Acad. Mgt. J.* 39(4): 802-835.
- Delery, J.E. 1998. Issues of fit in strategic human resource management: Implications for research. *Hum. Res. Mgt. R.*, 8(3): 289-310.
- Dougherty, D. 1992. Interpretive barriers to successful product innovation in large firms. *Org. Sci.* 3: 179-202.
- Dunlop, J.T., D. Weil. 1996. Diffusion and performance of modular production in the U.S. apparel industry. *Indust. Rel.* July: 334-355.
- Estrin, S., D.C. Jones, J. Svejnar. 1987. The productivity effects of worker participation: Producer cooperatives in Western economies. *J. Comp. Econ.* 11:40-61.
- Evans, W.R., W.D. Davis. 2005. High-performance work systems and organizational performance: The mediating role of internal social structure. *J. Mgt.* 31: 758-775.
- Faraj, S., L. Sproull. 2000. Coordinating expertise in software development teams. *Mgt. Sci.* 46: 1554-68.
- Fried, V.H., R.D. Hisrich. 1994. Toward a model of venture capital investment decision-making. *Fin. Mgt.* 23(3): 28-37.
- Gant, J., C. Ichniowski, K. Shaw. 2002. Social capital and organizational change in high-involvement and traditional work organizations. *J. Econ. Mgt. Strat.* 11: 289-328.
- Gibbert, M. 2006. Generalizing about uniqueness: An essay on an apparent paradox in the resource-based view. *J. Mgt. Inq.* 15: 124-134.
- Gittell, J.H., D. Weinberg, A. Bennett, J.A. Miller. 2007. Is the doctor in? Impact of job design on relational coordination and performance. Working paper.

- Gittell, J.H. 2006. Relational coordination: Coordinating work through relationships of shared goals, shared knowledge and mutual respect. O. Kyriakidou, M. Ozbilgin, eds. *Relational Perspectives in Organizational Studies: A Research Companion*. Cheltenham, UK: Edward Elgar Publishers.
- Gittell, J.H. 2002. Coordinating mechanisms in care provider groups: Relational coordination as a mediator and input uncertainty as a moderator of performance effects. *Mgt. Sci.* 48: 1408-1426.
- Gittell, J.H. 2001. Supervisory span, relational coordination and flight departure performance: A reassessment of post-bureaucracy theory. *Org. Sci.* 12(4): 467-482.
- Gittell, J.H. 2000. Organizing work to support relational coordination. *Int. J. Hum. Res. Mgt.* 11: 517-39.
- Heckscher, C. 1994. Defining the post-bureaucratic type. C. Heckscher, A. Donnellon, eds. *The Post-Bureaucratic Organization*. Thousand Oaks, CA: Sage.
- Horgan, J., P. Muhlau. 2006. Human resource systems and employee performance in Ireland and the Netherlands: A test of the complementarity hypothesis. *Int. J. Hum. Res. Mgt.* 17: 414-439.
- Huselid, M. 1995. The impact of human resource management on turnover, productivity and corporate financial performance. *Acad. Mgt. J.* 38: 635-72.
- Ichniowski, C., T. Kochan, D. Levine, C. Olsen, G. Strauss. 1996. What works at work: Overview and assessment. *Indust. Rel.* 35: 299-333.
- Ichniowski, C., K. Shaw, G. Prennushi. 1997. The effects of human resource practices on manufacturing performance: A study of steel finishing lines. *Amer. Econ. Rev.* 87: 291-313.
- Katz, J.N., L.C. Chang, O. Sangha, A.H. Fossel, D.W. Bates. 1996. Can comorbidity be measured by survey rather than medical record review? *Med. Care* 34: 73-84.
- Koch, M.J, R.G. McGrath. 1996. Improving labor productivity: Human resource management policies do matter. *Strat. Mgt. J.* 17(5): 335-354.
- Kochan, T.A., J.H. Gittell, B. Lautsch. 1995. Total quality management and human resource systems: An international comparison. *Int. J. Hum. Res. Mgt.* 6(2): 201-222.
- Laursen, K. 2002. The importance of sectoral differences in the application of complementary HRM practices for innovation performance. *Int. J. Econ. Bus.* 9: 139-156.

- Lawler, E.E., 111. 1988. Choosing an involvement strategy. *Acad. Mgt. Exec.* 2(3): 197-204.
- Leana, C.R., F. Pil. 2006. Social capital and organizational performance: Evidence from urban public schools. *Org. Sci.* 17(3): 353-366.
- Leana, C.R., H.J. Van Buren. 1999. Organizational social capital and employment practices. *Acad. Mgt. Rev.* 24: 538-555.
- Levin, D.Z., R. Cross. 2004. The strength of weak ties you can trust: The mediating role of trust in effective knowledge transfer. *Mgt. Sci.* 50: 1477-1490.
- Lopez, S. P., M.M.M. Peon, C.J.V. Ordas. 2005. Human resource practices, organizational learning and business performance. *Hum. Res. Develop. Int.* 8:147- 164.
- Luft, H.S. 1990. *Hospital Volume, Physician Volume and Patient Outcomes: Assessing the Evidence.* Ann Arbor, MI: Health Administration Press.
- MacDuffie, J. 1995. Human resource bundles and manufacturing performance: Organizational logic and flexible production systems in the world auto industry. *Indust. Labor Rel. Rev.* 48: 173-188.
- MacMillan, I.C., L. Zemann, P.N. Subbanarasimha. 1987. Criteria distinguishing successful from unsuccessful ventures in the venture screening process. *J. Bus. Venturing*, 2: 123-138.
- Mahoney, T.A., M.R. Watson. 1993. Evolving modes of workforce governance: An evaluation. In B.E. Kaufman, M.M. Kleiner, eds., *Employee Representation: Alternatives and Future Directions*: 135-168. Madison, WI: Industrial Relations Research Association, University of Wisconsin.
- Nahapiet, J., S. Ghoshal. 1998. Social capital, intellectual capital and the organizational advantage. *Acad. Mgt. Rev.* 23: 242-266.
- Nunnally, J. 1978. *Psychometric theory.* New York: McGraw Hill.
- Osterman, P. 1988. *Employment Futures: Reorganization, Dislocation and Public Policy.* New York: Oxford University Press.
- Osterman, P. 1994. How common is workplace transformation and who adopts it? *Indust. Labor Rel. Rev.* 47: 173-188.
- Pfeffer, J., J. Veiga. 1999. Putting people first for organizational success. *Acad. Mgt. Exec.* 13(2): 37-49.

- Piore, M. 1992. *The Social Embeddedness of Labor Markets and Cognitive Processes*. Keynote Address, European Association of Labor Economists, Warwick, England.
- Ramsey, H., D. Scholarios, B. Harley. 2000. Employees and high-performance work systems: Testing inside the black box. *British J. Indust. Rel.* 38: 501-532.
- Richard, O.C., N.B. Johnson. 2004. High performance work practices and human resource management effectiveness: Substitutes or complements? *J. Bus. Strat.* 21(2): 133-148.
- Rosenberg, R.D., E. Rosenstein. 1980. Participation and productivity: An empirical study. *Indust. Labor Rel. Rev.* 33: 355-367.
- Seibert, S.E., M.L. Kraimer, R.C. Liden. 2001. A social capital theory of career success. *Acad. Mgt. J.* 44: 219-237.
- Smith, K.G., C.J. Collins, K.D. Clark 2005. Existing knowledge, knowledge creation capability, and the rate of new product introduction in high-technology firms. *Acad. Mgt. J.* 48 (2): 346-57.
- Snell, S.A., J.W. Dean. 1992. Integrated manufacturing and human resource management: A human capital perspective. *Acad. Mgt. J.* 35: 467-504.
- Stewart, A.L., R.D. Hays, J.E. Ware. 1987. The MOS 36-item short form health survey (SF-36): Conceptual framework and item selection. *Med. Care*, 26: 724-35.
- Sun, L.Y., S. Aryee, K.S. Law. 2007. High performance human resource practices, citizenship behavior and organizational performance: A relational perspective. *Acad. Mgt. J.* 50(3): 558-577.
- Thompson, J.D. 1967. *Organizations in Action*. New York: McGraw-Hill.
- Tomer, J.F. 2001. Understanding high-performance work systems: The joint contribution of economics and human resource management. *J. Socio-Economics*, 30: 63-73.
- Tsai, W., S. Ghoshal. 1998. Social capital and value creation: The role of intrafirm networks. *Acad. Mgt. J.* 41: 464-476.
- Tsui, A.S., J.L. Pearce, L.V. Porter, Tripoli. 1997. Alternative approaches to the employee-organization relationship: Does investment in employees pay off? *Acad. Mgt. J.* 40(5): 1089-1121.

- Tsui, A.S., J.L. Pearce, L.V. Porter, J.P. Hite. 1995. Choice of employee-organization relationship: Influence of external and internal organizational factors. G.R. Ferris, eds., *Research in Personnel and Human Resource Management*, 13: 117-151. Greenwich, CT: JAI Press.
- Tyebjee, T.T., A.V. Bruno 1984. A model of venture capitalist investment activity. *Mgt. Sci.* 30: 1051-66.
- Van Maanen, J., S. Barley. 1984. Occupational communities: Culture and control in organizations. B.M. Staw, L.L. Cummings, eds., *Research in Organizational Behavior*: 287-365. Greenwich: JAI Press.
- Vogus, T. 2006. What is it about relationships? A behavioral theory of social capital and performance. *Labor Emp. Rel. Proc.*
- Weick, K.E., K. Roberts. 1993. Collective mind in organizations: Heedful interrelating on flight decks. *Admin. Sci. Q.* 38: 357-381.
- Welbourne, T.M., A.O. Andrews. 1995. Predicting performance of initial public offering firms: Should human resource management be in the equation? CAHRS Working Paper #95-02. Ithaca, NY: Cornell University
- West, M., C. Borrill, J. Dawson, J. Scully, M. Carter, S. Anelay, M. Patterson, J. Waring. 2002. The link between the management of employees and patient mortality in acute hospitals. *Int. J. Hum. Res. Mgt.* 13: 1299-1311.
- Whitener, E.M. 2001. Do 'high commitment' human resource practices affect employee commitment? A cross-level analysis using hierarchical linear modeling. *J. Mgt.* 27(5): 515-535.
- Wicks, D. 1998. *Nurses and Doctors at Work: Rethinking Professional Boundaries*. Buckingham: Open University Press.
- Wright, P.M., Gardner, L. Moynihan. 2006. Impact of HR practices on the performance of business units. *Human Resource Mgt. J.* 13(3): 21-36.
- Wright, P.M., Gardner, T.M., et al. 2001. Measurement error in research on human resources and firm performance: Additional data and suggestions for future research. *Pers. Psych.* 54: 875-901.
- Youndt, M.A., S. Snell, J.W. Dean, Jr., D.P. Lepak. 1996. Human resource management, manufacturing strategy, and firm performance. *Acad. Mgt. J.* 39(4): 836-866.

FIGURE 1: High Performance Work Practices Considered in Previous Studies

Horgan/Muhlau 2006	Vogus 2006	Collins/Clark 2003	Gittell 2000	Current Study
	Employment security			
Selection	Selection		Selection for cross-functional teamwork	Selection for cross-functional teamwork
Training	Training	Training		
Mentoring		Mentoring	Supervisory coaching	
	Performance appraisal	Performance appraisal	Cross-functional performance measurement	Cross-functional performance measurement
Incentives	Performance- based rewards	Incentives/rewards	Rewards for cross-functional teamwork	Rewards for cross-functional teamwork
			Cross-functional conflict resolution	Cross-functional conflict resolution
Mechanisms for knowledge sharing			Cross-functional boundary spanners	Cross-functional boundary spanners
Mechanisms for knowledge sharing				Cross-functional team meetings

FIGURE 2: Relational Model of High Performance Work System

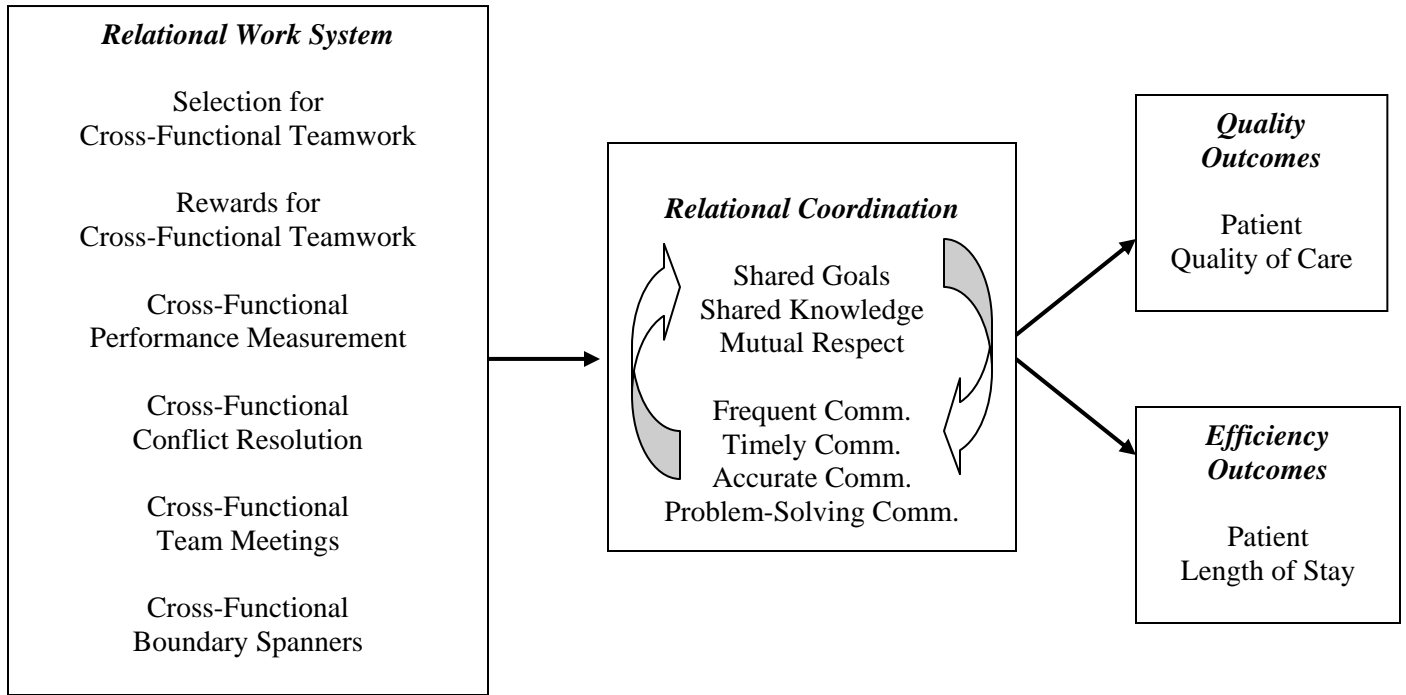
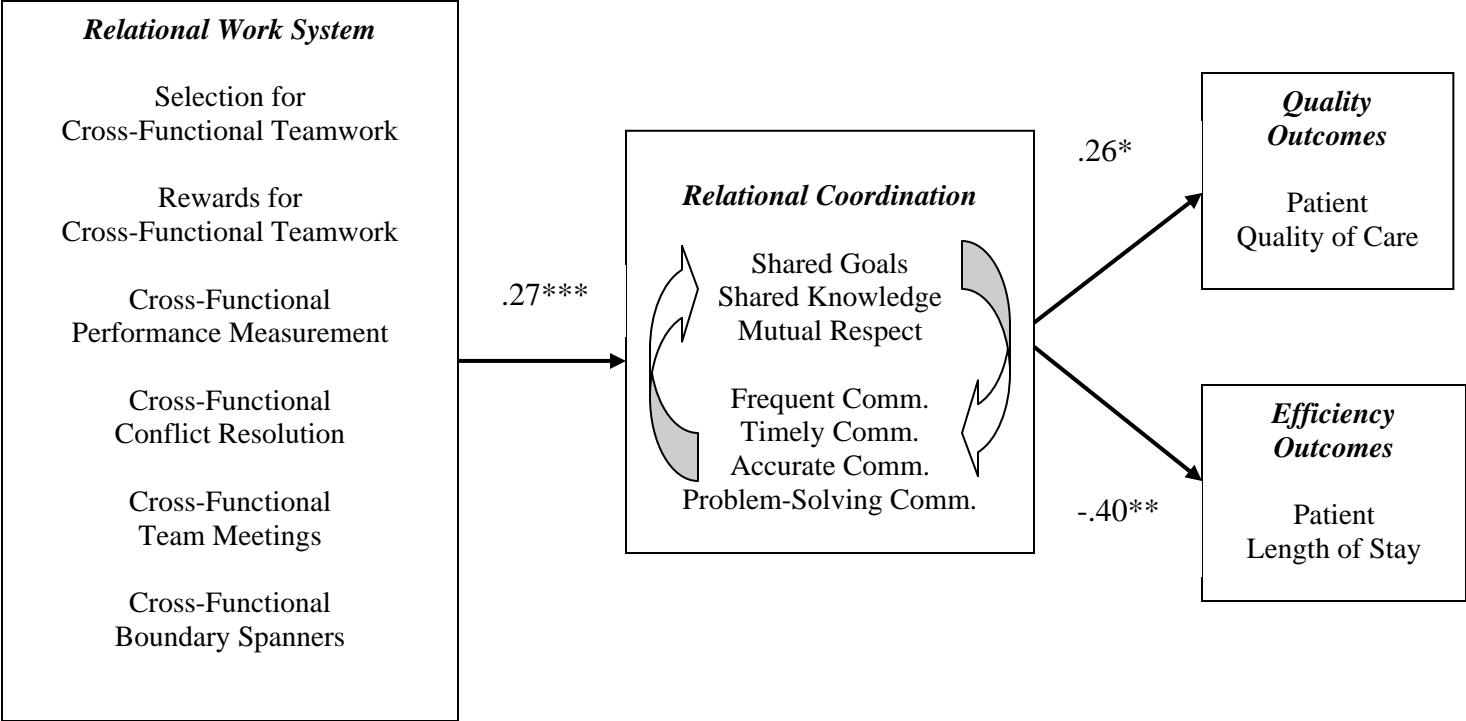


FIGURE 3: Support for Relational Model of High Performance Work System¹



¹ Standardized regression coefficients are shown.

TABLE 1: Relational Work System² and Relational Coordination³

	Range	Mean	SD	Obs
Selection				
Physicians selected for teamwork qualities	0-2	0.44	.88	9
Nurses selected for teamwork qualities	0-2	1.44	.73	9
Physical therapists selected for teamwork qualities	0-2	1.67	.88	9
Rewards				
Physicians rewarded for teamwork	0-3	.22	.67	9
Nurses rewarded for teamwork	0-2	.56	.88	9
Physical therapists rewarded for teamwork	0-2	1.11	1.05	9
Conflict Resolution				
Physicians have access to formal process	0-1	.44	.53	9
Nurses have access to formal process	0-1	.22	.44	9
Physical therapists have access to formal process	0-1	.33	.50	9
Performance Measurement				
Cross-functional approach to quality measurement	1-5	3.33	1.41	9
Problem-solving approach to quality measurement	1-5	2.78	1.39	9
Cross-functional approach to efficiency measurement*	1-5	2.56	1.88	9
Problem-solving approach to efficiency measurement	1-5	3.00	1.58	9
Team Meetings				
Nurses included in physician rounds	0-2	1.33	.87	9
Physical therapists included in physician rounds	0-2	.56	.88	9
Case managers included in physician rounds	0-2	.67	.87	9
Physicians included in nursing rounds*	0-2	.78	.44	9
Physical therapists included in nursing rounds*	0-2	1.44	.73	9
Case managers included in nursing rounds	0-2	1.33	1	9
Boundary Spanner				
Case manager caseload	6.7-40	26.3	10.8	9
Case manager discharge planning role	0-1	.89	.33	9
Case manager coordination role*	0-1	.44	.53	9
Primary nursing model	0-1	.56	.53	9
Relational Work System Index ($\alpha=.93$)				
Relational Coordination				
Frequency of communication	1-5	3.84	.73	334
Timeliness of communication	1-5	4.08	.62	334
Accuracy of communication	1-5	4.23	.62	333
Problem-solving focus of communication	1-5	4.05	.46	320
Shared goals	1-5	4.21	.61	331
Shared knowledge	1-5	3.93	.59	333
Mutual respect	1-5	3.81	.59	327
Relational Coordination Index ($\alpha=.86$)				

*These four items were dropped from relational work system index due to weak factor loadings.

² N=9 hospital units. Variables coded from interviews with administrators.

³ N = 336 care providers. Variables coded from network survey of care providers.

TABLE 2: Descriptive Data in Aggregate

	Range	Mean (SD)	Obs	Relational Work System	Relational Coordination	Quality of Care	Length of Stay
Relational Work System	-.95 – .83	0 (.66)	9	--			
Relational Coordination	-3.30 – 1.61	0 (.73)	336	.92** (.000)	--		
Quality of Care	1 – 5	4.01 (1.01)	788	.74* (.023)	.78* (.013)	--	
Length of Stay	2 – 35	5.11 (2.13)	809	-.68* (.045)	-.80** (.009)	-.17*** (.000)	--

***p<0.001 **p<0.01 *p<0.05 +p<0.10

TABLE 3: Descriptive Data by Hospital Unit

	Hospital 1	Hospital 2	Hospital 3	Hospital 4	Hospital 5	Hospital 6	Hospital 7	Hospital 8	Hospital 9
Relational Work System	-.95 n=1	-.54 n=1	-.28 n=1	.75 n=1	.83 n=1	.80 n=1	.12 n=1	-.32 n=1	-.42 n=1
Relational Coordination	-.19 (.84) n=52	-.27 (.84) n=51	-.17 (.54) n=33	.35 (.64) n=40	.12 (.52) n=15	.56 (.66) n=27	-.04 (.86) n=33	.14 (.61) n=39	-.02 (.58) n=46
Quality of Care	3.62 (1.11) n=108	3.68 (1.08) n=90	4.08 (.99) n=123	4.43 (.70) n=134	4.19 (.96) n=64	4.08 (1.04) n=63	3.98 (.94) n=93	4.24 (.85) n=68	3.62 (1.19) n=45
Length of Stay	5.57 (2.06) n=109	5.80 (2.39) n=93	5.90 (1.74) n=125	4.44 (1.46) n=135	4.17 (1.33) n=65	4.37 (3.94) n=67	5.60 (1.92) n=97	4.30 (1.00) n=70	4.98 (1.51) n=48

TABLE 4: Impact of Relational Work System on Relational Coordination⁴

	Relational Coordination
Relational Work System	.27*** (.000)
Physician Respondent	-.21*** (.000)
Resident Respondent	-.03 (.613)
Physical Therapist Respondent	-.09+ (.091)
Case Manager Respondent	.05 (.300)
Social Worker Respondent	-.09+ (.095)
Surgical Volume	-.05 (.386)
Constant	.06 (.274)
Within unit R ²	.07
Between unit R ²	.90
Observations	336

***p<0.001 **p<0.01 *p<0.05 +p<0.10

⁴ Unit of analysis is care provider (physicians, residents, nurses, physical therapists, social workers and case managers) assigned to work with joint replacement patients (n=336). Nurse respondent is the omitted category. Random effects regression is used to account for clustering of care providers by hospital unit (n=9). Relational work system and surgical volume are entered at the hospital unit level (n=9). Standardized regression coefficients are shown.

TABLE 5:
Impact of Relational Work System and Relational Coordination on Quality and Efficiency Outcomes⁵

	Patient Quality of Care			Patient Length of Stay		
	1a.	1b.	1c.	2a.	2b.	2c.
Relational Work System	.25*** (.000)		.00 (.993)	-.29*** (.000)		.10 (.400)
Relational Coordination		.26*** (.000)	.26* (.041)		-.31*** (.000)	-.40** (.001)
Patient Age	.01 (.888)	.00 (.904)	.00 (.904)	-.03 (.442)	-.03 (.465)	-.03 (.472)
Pre-Operative Functioning	-.01 (.853)	-.01 (.773)	-.01 (.774)	.02 (.672)	.02 (.586)	.02 (.556)
Comorbidities	.07 (.119)	.07 (.103)	.07 (.104)	.09* (.037)	.08* (.044)	.08* (.046)
Surgery Type (hip = 1)	.11** (.009)	.11** (.005)	.11** (.005)	.01 (.673)	.01 (.822)	.01 (.884)
Psychological Well-Being	.14** (.001)	.13** (.001)	.14** (.001)	-.09* (.036)	-.08* (.042)	-.08* (.047)
Marital Status (married = 1)	.06 (.165)	.07 (.127)	.07 (.128)	.03 (.498)	.02 (.616)	.02 (.650)
Gender (female = 1)	-.04 (.391)	-.03 (.442)	-.03 (.415)	.06 (.161)	.05 (.195)	.05 (.202)
Race (black = 1)	.03 (.472)	.03 (.469)	.03 (.445)	.02 (.664)	.02 (.682)	.02 (.652)
Surgical Volume	.08+ (.088)	.08+ (.081)	.08+ (.081)	.16*** (.000)	.15*** (.000)	.15*** (.000)
Constant	.01 (.874)	-.00 (.952)	-.00 (.953)	-.01 (.860)	.01 (.881)	.01 (.836)
Within unit R ²	.05	.05	.05	.03	.03	.03
Between unit R ²	.64	.73	.73	.73	.82	.82
Observations	588	588	588	599	599	599

***p<0.001 **p<0.01 *p<0.05 +p<0.10

⁵ Unit of observation is the joint replacement patient (n=588 for quality of care, n=599 for length of stay). Random effects regression is used to account for clustering of patients by hospital unit (n=9). Relational work system, relational coordination and surgical volume are entered at the hospital unit level (n=9). Standardized regression coefficients are shown.