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A SOCIAL CAPITAL MODEL OF HIGH PERFORMANCE WORK SYSTEMS

In this paper we explore a causal mechanism through which high performance work systems affect 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 social capital models of high performance work systems are a promising counterpart to models that focus on employee skills or commitment.
(127 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 (Huselid 1995; Becker and Gerhart 1996; Ichniowski Kochan Levine Olson and Strauss 1996; Ramsey Scholarios and Harley 2000; Bailey Berg and Sandy 2001; Shaw and Delery 2003). Researchers have documented the impact of human resource practices on efficiency outcomes such as worker productivity (e.g. Bartel 1994), on quality outcomes such as patient mortality (West et al 2002), and on broader sets of performance outcomes (e.g. Bartel 2004; Wright Gardner and Moynihan 2006). Human resource practices have been found to explain performance differences among steel finishing lines (Ichniowski Shaw and Prennushi 1996), 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 there is some disagreement among researchers, it is generally agreed that these practices include selection, training, mentoring, incentives, and knowledge-sharing mechanisms (Horgan and Muhlau 2006; Isom-Rodriguez 2006), and that these practices are more effective when they are implemented in bundles that are mutually supporting or complementary (MacDuffie 1995; Dunlop and Weil 1996; Ichniowski Shaw and Prennushi 1996; Batt 1999; Cappelli and Neumark 2001; Laursen 2002).

There is less agreement however on the causal mechanisms through which high performance work systems influence performance outcomes (Delery and Shaw 2001; Bowen and Ostroff 2004). In this paper we develop a social capital model of high performance work systems, in contrast to the human capital and commitment perspectives. Rather than focusing on knowledge and skills of employees or on alignment between employees and their employer, this alternative model focuses on *relationships between employees* as the causal mechanism between high performance work systems and performance. We know that social capital can be developed by organizations as a distinctive organizational capability and a source of competitive advantage (Nahapiet and Ghoshal 1998; Leana and Van Buren 1999). But so far there has been relatively little insight into how organizations can build the social capital that serves these performance objectives. We argue that one way to do so is to develop a high performance work system in which each component work practice reaches across multiple functions to engage employees in a coordinated effort. The high performance work practices identified in this study are distinct from the typical high performance work practices found in the literature due to their focus on building employee-to-employee relationships. We label them relational work practices to flag this important difference and argue that together they form a relational work system.

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 social capital, 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 relationships among care providers. Hospitals are notorious for operating with well-defined silos and with turf battles between them. Building social capital 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). According to this perspective, managing employees in a high performance work system requires involving and empowering employees (Whitener 2001). Consistent with this view, studies have found that particular work practices are associated with increased employee control over work (Tomer 2001), increased employee involvement (Ichniowski et al 1996) and higher levels of commitment, and that these behaviors in turn are positively associated with firm performance (e.g. Rosenberg and Rosenstein 1980; Estrin Jones and Svejnar 1987; Ichniowski et al 1996).

Though the human capital perspective recognizes that skills and knowledge must be shared among employees to be useful, and though the commitment-based perspective recognizes the importance of manager/worker relationships in achieving motivation and commitment, neither of these perspectives explicitly conceptualizes *relationships between employees* as the desired intermediate outcome of high performance work systems. 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 2006; 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 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. Specifically, "relational coordination is a mutually reinforcing process of interaction between communication and relationships carried out for the purpose of task integration" (Gittell 2002: 301).

Relatively little is known about how organizations influence the formation of social capital among their employees. However, some progress has been made. 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 re-designed 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, et al (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 hiring, 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) 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 demonstrated that the impact of these high performance practices on firm performance is mediated by the strength of firms' top management team social networks.

Most recently, Vogus (2006) argued that that high performance work practices such as selection, training, performance appraisal, empowerment 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.

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 et al, 2005) and mindful interacting (Vogus 2006), 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 Practices to Relational Work Practices

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 focused on fostering relationships among employees. This new understanding of high performance work systems builds on 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, 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, 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.’

We propose that the work practices that foster social capital between employees include: selection and training for cross-functional teamwork; measuring performance and providing rewards based on contributions to broad goals; the use of conflict resolution to build relationships between employees; and information sharing or coordinating mechanisms to foster connections; as well as other candidates. We call these *relational work practices* in recognition that they are distinct from the usual conceptualization of high performance work practices, which focus more on worker skills or commitment than on the relationships between employees. We argue further that these relational work practices together form a *relational work system* that influences performance outcomes through its positive effect on social capital. In other words, increased levels of social capital explain or mediate the relationship between relational work systems and performance outcomes.

Hypothesis 1: The adoption of relational work systems positively predicts the formation of social capital among employees.

Hypothesis 2: The adoption of relational work systems positively predicts performance outcomes.

Hypothesis 3: The effect of relational work systems on performance outcomes is mediated by the formation of social capital among employees.

These hypotheses together serve as the basis for a social capital model of high performance work systems, illustrated in Figure 1.

[Insert Figure 1 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, nested within the nine orthopedics units. Individual patient surveys and hospitalization records were used to measure performance outcomes at the level of individual patients, nested within the nine orthopedics units.

To measure work practices, administrators and direct care providers were interviewed in each of the nine orthopedics units, 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 conducted 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.

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. 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 include 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. 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 functions, 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. Cronbach's alpha for the reliability of the selection index was 0.753.

Rewards for cross-functional teamwork were measured by asking administrators about the criteria for rewards for physicians, nurses and physical therapists, probing as to whether rewards were based purely on individual performance or whether 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 administrators 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 function had no access to formal cross-functional conflict resolution processes and where 1 indicated access. Cronbach's alpha for the rewards index was 0.636 and for the conflict resolution index was 0.790.

Cross-functional performance measurement was measured by asking administrators 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. We 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. Cronbach's alpha for the performance measurement index was 0.906.

Cross-functional team meetings were measured by asking administrators 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 function 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. Caseload was measured as a continuous variable, while each of the roles -- utilization review 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. Cronbach's alpha for the team meetings index was 0.705, and for the boundary spanner index was 0.804.

Together, these relational practices can be conceptualized as forming a *relational work system*. Cronbach's alpha for the relational work system index was 0.920. A factor analysis resulted in a one-factor solution with an eigenvalue of 3.29 (factor 2 with an eigenvalue of 0.93). Factor loadings were: selection 0.842, rewards 0.758, conflict resolution 0.813, performance measurement 0.604, meetings 0.536 and boundary spanner 0.834.

[Insert Table 1 about here.]

Relational Coordination

As described above, relational coordination is a form of organizational social capital focused on the coordination of work, and 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.

Relational coordination is an equally weighted index of these seven items with a Cronbach’s alpha of 0.86, suggesting a high level of construct validity (Nunnally, 1978). Factor analysis suggested that relational coordination is best characterized as a single factor with the following factor loadings: frequent communication 0.547, timely communication 0.772, accurate communication 0.789, problem-solving communication 0.801, shared goals 0.614, shared knowledge 0.607, and mutual respect 0.659. The eigenvalue for this factor was 3.34, whereas factor 2 had an eigenvalue of 0.65.

We then tested whether relational coordination could be aggregated into a unit-level construct. Using one-way analysis of variance, significant cross-unit differences in relational coordination were found ($p<0.0001$), and also significant cross-functional differences in relational coordination ($p=0.0415$). When unit-level and function-level differences were considered jointly, unit-level differences remained significant: unit-level differences had an F- statistic of 0.0004, while function-level differences had an F-statistic of 0.2280. The intra-unit correlation for relational coordination was significantly greater than zero ($p<0.05$). Taken together, these results were consistent with treating relational coordination at the unit level. 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 nested within the nine orthopedics units in our study. 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. A quality of care index was developed from the 25 survey items pertaining to the patient's hospital experience. An equally weighted index with potential values from 1 to 5 was created from these items for each individual patient in the study. Cronbach's alpha for this quality of care index was 0.843.

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.

Provider Control Variables

Provider control variables include dummy variables indicating the functional identity of the respondent, given that physicians, nurses, therapists, case managers and social workers can be expected to participate differently in relational coordination due to differences in their professional identities. In particular, physicians are expected, other things equal, to engage less strongly in relational coordination. In all equations, case managers are the omitted response category so that the coefficient on each response category indicates the differential between respondents in that function and case manager respondents.

Patient Control Variables

Control variables were selected for this patient population 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 well-being, 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 well-being 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 well-being 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 the relational work system index and each relational work practice (n = 9 units) on relational coordination (n = 321 care providers in 9 units), controlling for the functional identity of the care provider respondent. To test *Hypothesis 2*, we regressed the relational work system index (n = 9 units) on quality outcomes (n = 588 patients in 9 units) and efficiency outcomes (n = 599 patients in 9 units), controlling for the patient characteristics expected to affect these outcomes.

To test *Hypothesis 3*, we aggregated relational coordination to the unit level (n = 9 units) and entered it along with relational work systems (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 each of the above equations, random effects modeling is used to adjust standard errors for the multi-level nature of the data (Bryk and Raudenbusch 1992). 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 are 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.

[Insert Table 2 about here.]

Relational Work Systems and Relational Coordination

First, we assessed associations between relational work systems (n = 9 units) and relational coordination (n = 321 care providers in 9 units). Results are reported in Table 3. Relational work systems are positively associated with relational coordination as reported by care providers ($r = 0.30$, $p < 0.001$). The individual work practices that make up the relational work system are also positively associated with relational coordination including: employee selection for teamwork ($r = 0.15$, $p = 0.007$), rewards for teamwork ($r = 0.23$, $p < 0.001$), cross-functional performance measurement ($r = 0.18$, $p = 0.002$), cross-functional conflict resolution ($r = 0.20$, $p < 0.001$), cross-functional team meetings ($r = 0.17$, $p = 0.009$), and cross-functional boundary spanners ($r = 0.18$, $p = 0.002$).

The estimated effect of relational work systems is statistically significant and moderately large. The coefficient of 0.30 on relational work systems suggests that for every standard deviation increase in relational work systems, a 0.30 standard deviation increase in relational coordination can be expected. The equations explain relatively little within-unit variation in relational coordination ($R^2 = 0.04$), but explain a large percentage of between-unit variation in relational coordination ($R^2 = 0.91$ for the most complete model). These results provide strong support for our hypothesis that relational work systems support the development of social capital among employees (*Hypothesis 1).*

[Insert Table 3 about here.]

Relational Work Practices, Relational Coordination and Quality Outcomes

Next, we assessed associations between relational work systems ($n = 9$ units) and quality outcomes ($n = 588$ patients in 9 units). See Table 4 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 ($r = 0.24$, $p = 0.020$) 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 0.24 on relational coordination suggests that for every standard deviation increase in relational coordination, a 0.24 standard deviation increase in the quality of care can be expected. The equations explain relatively 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 ($R^2 = 0.68$ for the most complete model). These results suggest that relational work systems predict high quality outcomes (*Hypothesis 2*), and that they do so by strengthening social capital among employees (*Hypothesis 3*).

[Insert Table 4 about here.]

Relational Work Practices, Relational Coordination and Efficiency Outcomes

Finally, we assessed associations between relational work systems (n = 9 units) and efficiency outcomes (n = 599 patients in 9 units). See Table 4 for results. Results in column 3 show that relational work systems are associated with shorter risk-adjusted lengths of stay ($r = -0.30$, $p < 0.001$). 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 ($r = -0.31$, $p = 0.001$) 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 -0.30 on relational work systems suggests that for every standard deviation increase in relational work systems, a 0.30 standard deviation decrease in patient length of stay can be expected. The coefficient of -0.31 on relational coordination suggests that for every standard deviation increase in relational coordination, a 0.31 standard deviation decrease in the length of stay can be expected. The equations explain relatively 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 ($R^2 = 0.81$ for the most complete model). These results suggest that relational work systems predict efficiency outcomes (*Hypothesis 2*), and that they do so by strengthening social capital among employees (*Hypothesis 3*).

See Figure 2 for a summary of results.

[Insert Figure 2 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 social capital between employees who perform distinct functions. Instead of focusing on how work practices shape individual worker attributes (such as skills or commitment), social capital models focus instead on how work practices strengthen or weaken employee relationships with other employees. The work practices expected to build social capital 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*.

This study contributes to a social capital theory of high performance work systems by introducing the concept of relational work practices. 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 however be redesigned to encourage the development of relationships between employees in different functions (e.g., Gittell 2000). Following Collins and Clark (2003) and Vogus (2006), this study is relatively unique in demonstrating empirically that the effects of high performance work practices on outcomes can be mediated through relationships among employees. These empirical results thus suggest that social capital theories of high performance work systems are a promising counterpart to theories of high performance work systems that focus on worker skill or commitment.

Despite these contributions, this study is limited in two primary 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. Second, theories of high performance work systems typically argue that work practices are more effective when they are offered in bundles that are mutually supporting or complementary (MacDuffie 1995; Dunlop and Weil 1996; Ichniowski et al 1996; Batt 1999; Cappelli and Neumark 2001;

Wood and Wall 2001; Laursen 2002). Though we found support for bundling these relational practices together into a relational work system, we did not develop or test hypotheses regarding specific complementarities among these work practices. If complementarities do exist among these practices, we would expect for example that selecting employees for cross-functional teamwork would have a greater impact on desired outcomes if rewards and performance measurement were also re-designed.

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 social capital 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 is based instead on ties between roles. The relational work system we explored in this paper is designed to ensure that sufficient social capital exists among employees whose work is interrelated, 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 high performance work system based on social capital 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, organizational social capital must be built collectively. Thus, while it is likely to be harder to achieve, the high performance work system introduced here has the potential to provide organizations with a relatively sustainable source of competitive advantage.

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FIGURE 1: Social Capital Model of High Performance Work Systems

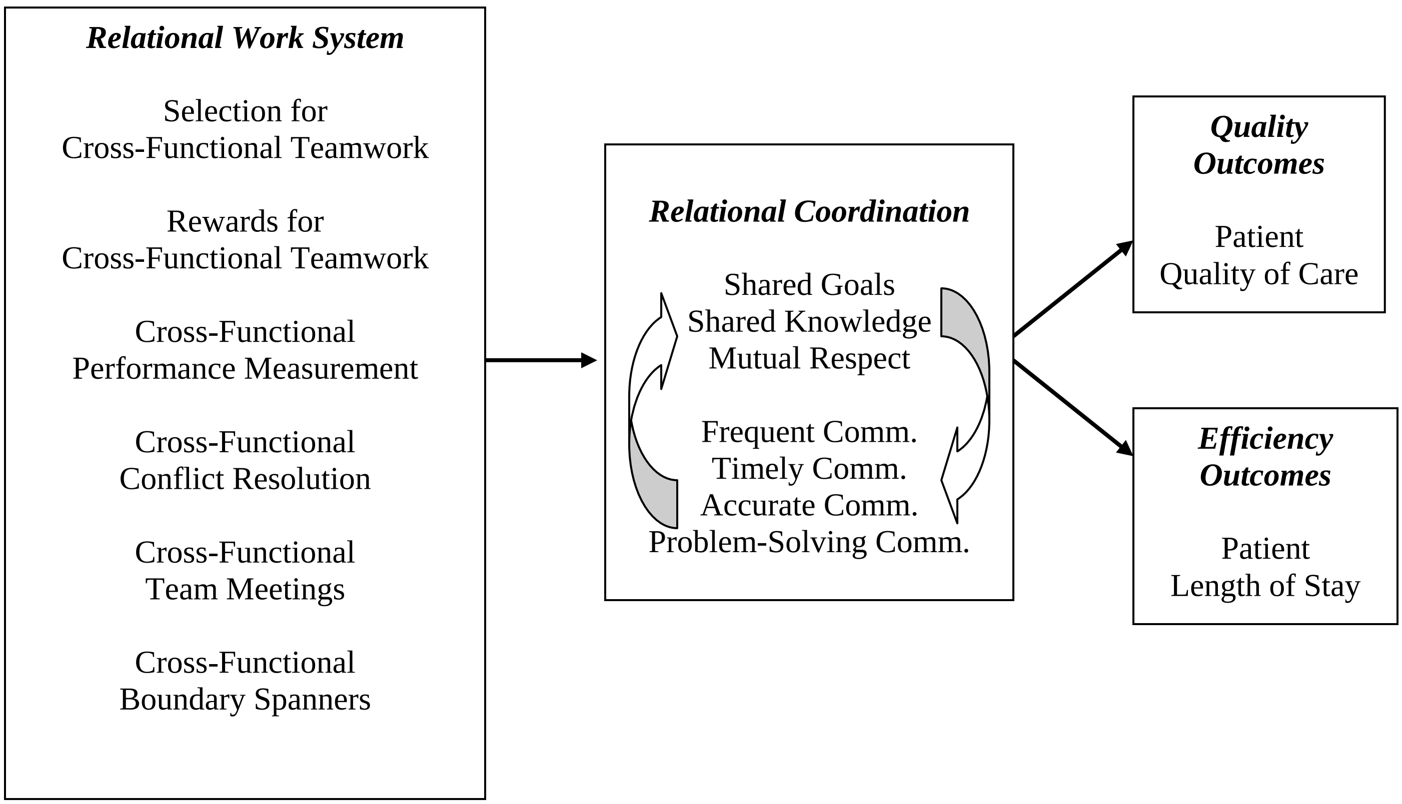

FIGURE 2: Support for Social Capital Model of High Performance Work Systems

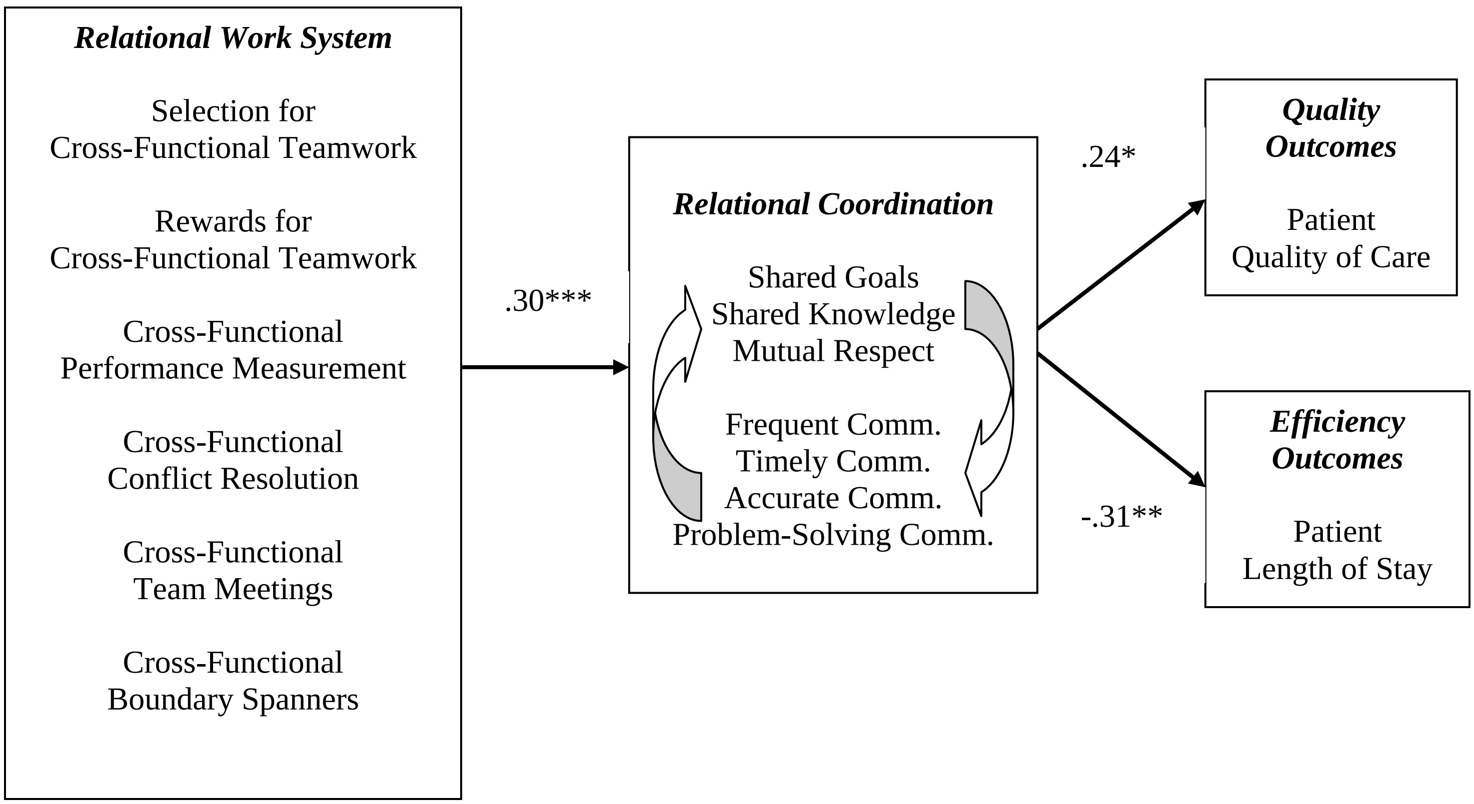

TABLE 1: Relational Work Practices[1] and Relational Coordination[2]

	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
Selection Index (α=.75)				
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
Rewards Index (α=.64)				
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
Performance Measurement Index (α=.91)				
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
Conflict Resolution Index (α=.79)				
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	1.00	9
Team Meeting Index (α=.70)				
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 utilization review role	0-1	.89	.33	9
Primary nursing model	0-1	.56	.53	9
Boundary Spanner Index (α=.80)				
Relational Work System Index (α=.92)				
Relational Coordination				
Frequency of communication	1-5	3.83	.81	334
Timeliness of communication	1-5	3.99	.69	334
Accuracy of communication	1-5	4.18	.68	333
Problem-solving focus of communication	1-5	4.00	.50	315
Shared goals	1-5	4.11	.68	331
Shared knowledge	1-5	3.74	.67	333
Mutual respect	1-5	3.73	.67	326
Relational Coordination Index (α=.86)				

[1] N=9 hospital units. Variables coded from interviews with administrators.
[2] N = 334 care providers. Variables coded from network survey of care providers.

TABLE 2: Descriptive Data

	Range	Mean (SD)	Obs	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Relational Coordination	-3.74 – 1.56	0 (.75)	336	--								
2. Relational Work System	-.90 – .86	0 (.60)	9	.91** (.001)	--							
3. Selection	-1.62 – 1.00	0 (.81)	9	.61+ (.080)	.86** (.003)	--						
4. Rewards	-.67 – 1.34	0 (.76)	9	.86** (.003)	.69* (.038)	.49 (.185)	--					
5. Performance Measurement	-1.25 – 1.16	0 (.88)	9	.77* (.015)	.65+ (.056)	.23 (.557)	.59+ (.097)	--				
6. Conflict Resolution	-.67 – 1.38	0 (.84)	9	.74* (.023)	.85** (.004)	.58+ (.099)	.61+ (.080)	.70* (.035)	--			
7. Team Meetings	-1.15 – .98	0 (.98)	9	.46 (.216)	.54 (.138)	.57 (.107)	.47 (.206)	.27 (.480)	.11 (.781)	--		
8. Boundary Spanners	-1.87 – 0.83	0 (.79)	9	.69 (.039)	.84** (.004)	.87** (.002)	.58 (.104)	.22 (.561)	.66+ (.055)	.33 (.379)	--	
9. Quality of Care	1 – 5	4.01 (1.01)	788	.78* (.013)	.68* (.046)	.56 (.117)	.59+ (.092)	.57 (.108)	.31 (.409)	.74* (.024)	.54 (.135)	--
10. Length of Stay	2 – 35	5.11 (2.13)	809	-.80** (.009)	-.65+ (.056)	-.39 (.294)	-.52 (.147)	-.76* (.018)	-.65+ (.060)	-.01 (.970)	-.53 (.143)	-.18*** (.000)

TABLE 3: Impact of Relational Work System on Relational Coordination[3]

	Relational Coordination						
	1.	2.	3.	4.	5.	6.	7.
Relational Work System	.30*** (.000)						
Selection	--	.15** (.007)					
Rewards	--	--	.23*** (.000)				
Performance Measurement	--	--	--	.18** (.002)			
Conflict Resolution	--	--	--	--	.20*** (.000)		
Team Meetings	--	--	--	--	--	.17** (.009)	
Boundary Spanners	--	--	--	--	--	--	.18** (.002)
Physician Respondent	-.28* (.011)	-.29* (.010)	-.30** (.006)	-.31** (.005)	-.30** (.007)	-.30** (.007)	-.28* (.012)
Resident Respondent	-.08 (.413)	-.11 (.267)	-.08 (.404)	-.10 (.314)	-.10 (.293)	-.11 (.286)	-.10 (.312)
Nurse Respondent	-.20 (.124)	-.18 (.165)	-.20 (.123)	-.19 (.144)	-.22+ (.099)	-.17 (.194)	-.20 (.137)
Physical Therapist Respondent	-.05 (.603)	-.05 (.652)	-.07 (.521)	-.10 (.361)	-.08 (.463)	-.06 (.573)	-.05 (.666)
Social Worker Respondent	-.13+ (.075)	-.13 (.102)	-.13+ (.79)	-.14+ (.079)	-.14+ (.071)	-.13 (.105)	-.12 (.109)
Constant	.07 (.211)	-.02 (.740)	-.02 (.714)	-.02 (.741)	-.02 (.739)	-.02 (.753)	-.02 (.734)
Within unit R^2	.04	.04	.04	.04	.04	.04	.04
Between unit R^2	.91	.44	.76	.60	.61	.44	.55
Observations	321	321	321	321	321	321	321

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

[3] Unit of analysis is care provider (physicians, residents, nurses, physical therapists, social workers and case managers) assigned to work with joint replacement patients (n=321). Case manager is the omitted respondent category. Random effects regression is used to account for clustering of care providers by hospital unit (n=9). Standardized regression coefficients are shown.

TABLE 4: Impact of Relational Work System and Relational Coordination on Quality and Efficiency Outcomes[4]

	Patient Quality of Care		Patient Length of Stay	
	1a.	1b.	2a.	2b.
Relational Coordination		.24* (.020)		-.31** (.001)
Relational Work System	.25*** (.000)	.02 (.862)	-.30*** (.000)	.00 (.984)
Patient Age	.01 (.862)	.01 (.847)	-.02 (.543)	-.02 (.518)
Pre-Operative Functioning	-.01 (.831)	-.01 (.770)	.02 (.541)	.03 (.453)
Comorbidities	.06 (.136)	.07 (.122)	.09* (.036)	.08* (.034)
Surgery Type (hip = 1)	.11** (.009)	.11** (.005)	.01 (.767)	.00 (.939)
Psychological Well-Being	.14** (.001)	.14** (.001)	-.09* (.029)	-.08* (.040)
Marital Status (married = 1)	.06 (.179)	.06 (.151)	.03 (.528)	.02 (.683)
Gender (female = 1)	-.04 (.364)	-.03 (.415)	.06 (.140)	.05 (.181)
Race (black = 1)	.03 (.450)	.03 (.446)	.03 (.509)	.02 (.539)
Surgical Volume	.09* (.017)	.11** (.006)	.18*** (.000)	.15*** (.000)
Constant	.02 (.683)	-.00 (.970)	-.01 (.750)	.00 (.978)
Within unit R^2	.05	.05	.03	.03
Between unit R^2	.56	.68	.72	.81
Observations	588	588	599	599

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

[4] 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 and relational coordination are entered at the hospital unit level (n=9). Standardized regression coefficients are shown.