

Toward a Model of Organizational Human Capital Development: Preliminary Evidence from Taiwan

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ABSTRACT This article seeks to explore the black box mediating between human resource management practices and firm performance. It is hypothesized that high performance work systems develop organizational human capital, which in turn, positively affect firm performance. Two organizational antecedents are also hypothesized to lead to the implementation of high performance work systems. They are a top management value that sees human resources and human resource management practices as major sources of competitive advantage, and organizational strategy that seeks to differentiate by product or service innovation. These hypotheses were tested by analyzing questionnaires from 62 human resource managers and 206 engineers in 77 information technology companies. Research findings suggest that organizational human capital (employee competencies and commitment) mediates the relationship between high performance work systems and firm performance. Top management human resource values and organizational strategy have a joint effect on the implementation of high performance work systems. This study is exploratory and findings are not conclusive. The implications and limitations of this study are discussed.

KEY WORDS: Human capital, high performance work systems, firm performance, exploratory study

Introduction

The past 15 years have witnessed numerous pieces of research exploring the relationships between human resource management practices and organizational performance (Wright et al., 1994; Youndt & Snell, 2004; Rogers & Wright, 1998). Although much of this work would suggest that human resource management systems impact firm performance and, especially, that what have become to be known as 'high performance work systems' often enhance performance (Bae & Lawler, 2000; Guthrie et al., 2002), research interest increasingly centres on understanding the mechanisms by which this occurs. The 'black box' mediating between human resource management practices and firm performance is not well understood (cf. Becker et al., 1997; Wright & Gardner, 2000).

In this article, we develop a framework that explores at least one mechanism that could help to explicate the high performance work system-firm performance relationship. It is argued that high performance work systems facilitate the formation of human capital within firms. Of course, increased organizational human capital would be expected to lead to increased organizational effectiveness. If such a mechanism exists, then organizational human capital ought to mediate any relationship between a firm's use of high performance work systems and a firm's performance. We study such a mechanism here using organizational data drawn from the information technology (IT) industries in Taiwan. Our findings support this relationship.

The use of data from Taiwan is significant for several reasons. First, despite cultural forces that might be expected to limit the effectiveness of high performance work systems in East and South East Asia, for example, managerial paternalism and hierarchy (Redding, 1993; Sheh, 2001), research suggests that companies operating in East and South East Asia, including even

indigenous companies, are relatively open to accepting and implementing high performance work systems (Chen et al., 2005) and that high performance work systems have been demonstrated to be effective in increasing a firm's performance in this region, again both in foreign-owned and indigenous companies (Bae et al., 2003). This is in contrast to what has been found in Europe and may be attributable to cultural change in the region brought about by rapid economic development. In particular, the high technology sector in Taiwan and many other East and South East Asian economies (for example, Korea, Singapore, Mainland China) is central to their growth and future competitiveness.

Finally, Chang & Chen (2002) have conducted a study in a renowned science-based industrial park in Taiwan investigating the effects of human resource management (HRM) practices on firms' performance. They also examined the moderating effects of organizational strategies (cost leadership and differentiation) on the HRM practice-performance relationships. Similar as their study may seem to the one reported here, the work we have done is to reveal the black box mediating between HRM practices and firms' performance. In this article, HRM practices, affected by innovation strategy and top management human resource values, can be conceptualized as those that develop organizational human capital which result in the good performance of firms. The causal chain examined in this essay signifies how organizational human capital should be developed and organizational antecedents to be in place for the development of organizational human capital to be effective. Thus, our article differs from the Chang and Chen study in fundamental ways. Our work is consistent with similar research undertaken in the United States by Youndt & Snell (2004), who demonstrate a similar mediating effect of organizational human capital.

Theoretical Background and Hypotheses

Human Capital

The prevailing definition of human capital adopts a competence perspective (Elias & Scarbrough, 2004). While Flamholtz & Lacey (1981) narrowly focused on employees' skills in their human capital theory, other researchers have defined human capital as employees' knowledge, skills and capabilities that are of economic value to organizations (Snell & Dean, 1992; Nahapiet & Ghoshal, 1998; Youndt et al., 2004). McKelvey (1983) proposed classifications of organizations based on their competencies, whereby organizational competencies were represented by the knowledge, skills and capabilities of organizational members. More precisely, 'human capital embraces the abilities and know-how of men and women that have been acquired at some cost and that can command a price in the labor market because they are useful in the productive process' (Parnes, 1984: 32). Thus, the central tenet of human capital inspected from a competence perspective is the purported contributions of human capital to positive outcomes of organizations. However, human resources (HR) with high levels of skills, capabilities and knowledge may not necessarily lead to good financial performance of firms. As argued by Roos et al. (1998: 37), 'Companies need employees who are capable and willing to use their skills and abilities to the advantage of the company and who can motivate the whole company to reach these goals'. Thus, it is equally important for organizations to have human capital with skills and capabilities as it is to have human capital that is willing to identify itself with company goals and commit itself to achieving them (Wright et al., 1994; Ulrich, 1998). For the purpose of this article, we define human capital as 'employees' competencies and commitment that help create a company's competitive advantage'.

Our definition of human capital is consistent with the resource-based view of the firm, which signifies a new way of inspecting human capital (Welch & Nayak, 1992). This view contends that

organizations differ in their unique bundles of resources and capabilities. Thus, the most important task of a firm is to maximize performance outcomes through the optimal deployment of existing resources and capabilities, while at the same time, developing its resource base to remain competitive in the future (Grant, 1996; Teece et al., 1997). Among various types of resources, the view accredits human capital as the most important type of resources a firm has (Pfeffer, 1994; Wright et al., 1994). Human capital, in particular a high level of competency and commitment, is a unique resource that creates performance differentials (Bontis & Fitz-enz, 2002; Noe et al., 2003). The process by which human capital creates performance differentials is subject to a firm's specific historical contexts, characterized by human behaviours and interactions exhibited throughout the course of firm development, which are by nature complex and difficult to imitate. Thus, the unique historical context, causal ambiguity and social complexity make a firm's human capital inimitable and non-substitutable (Wright et al., 1994; Teece et al., 1997).

Moreover, our definition of organizational human capital serves to depart from extant literatures that define human capital from the perspective of formal education and job tenure (for example, Pennings et al., 1998; Hitt et al., 2001). As argued above, our definition originates from a broader set of literatures that stress the importance of competencies (Snell & Dean, 1992; Nahapiet & Ghoshal, 1998; Youndt et al., 2004). Such competencies should be geared toward achieving goals and objectives of organizations (Wright et al., 1994; Ulrich, 1998). Thus, employee commitment should also be developed and demonstrated. It is only with a combination of competencies and commitment that organizational human resources can become a major source of firm competitive advantage (Davenport, 1999; Bontis & Fitz-enz, 2002; Noe et al., 2003). Defining organizational human capital from the perspective of formal education and job tenure may be insufficient as both may not be directly related to competencies and the commitment required to accomplish organizational goals and objectives.

Given the importance of organizational human capital, academics and practitioners alike have agreed that investment in human capital development is often a prerequisite to good financial performance and competitive advantage (Delaney & Huselid, 1996). However, the links between human capital and a firm's financial performance has not yet been fully explored (Reed & DeFillippi, 1990). Thus, an important objective of this article is to address this link so that our understanding of human capital development can be advanced.

High Performance Work System

The high performance work system, according to Neal & Tromley (1995), is a derivative of and an improvement on Total Quality Management. This system also has various names, for example, 'high involvement' (Lawler, 1992), 'high commitment' (Arthur, 1992), 'high performance' (Huselid, 1995) or 'sophisticated' (Koch & McGrath, 1996) work practices (Guthrie et al., 2002: 185). This system aims to provide employees with 'the skills, information, motivation and latitude resulting in a work force which is a source of competitive advantage' (Guthrie et al., 2002: 185). The range of managerial practices comprised in this system includes compensation, staffing, training and development, performance management, and other HRM practices (Noe et al., 2004). Employees become the source of competitive advantage because their commitment and ability are enhanced and they are able to provide products and services that are valued by customers.

Previously, aspects of high performance work systems have been examined in the Far Eastern context and were found to be positively associated with firm performance (Bae & Lawler, 2000; Bae et al., 2003). These aspects include selective recruitment, training and development, employee empowerment and pay for performance. In this article, in addition to these four aspects, competitive pay schemes and job rotation are included in the high performance work system.

Competitive pay schemes refer to pay levels of company which attract high quality people to join the company and motivate company personnel to contribute to it (Snell & Dean, 1992). Thus, they are associated with developing a firm's human capital. Job rotation has long been recognized as a progressive human resource development practice (Hall, 1976; Foulkes, 1980), which enhances learning and work experiences for career development (Campion et al., 1994). Thus, we cannot deny the potential contribution it can deliver to human capital development.

The transferability of high performance work systems to industries in Taiwan has been discussed and empirically studied in the literature in recent years (for example, Uen, 1997; Huang, 2001; Bae et al., 2003). The research shows that industries in this economy are becoming increasingly receptive to, and starting to implement, high performance work systems, especially in technology-based companies. As the winds of globalization sweep across the economy, it is undergoing notable changes, changes of cultural traits characterized as having been hierarchical and collectivist (Hofstede, 1997) and becoming more individualistic and egalitarian (Huang, 2001; Bae et al., 2003). These new cultural traits are more often observed among those of the younger generation who may be educated in the USA and who become the major entrepreneurial and professional elites of technology-based companies (for example, information technology (IT) companies) in Taiwan. Although the traditional cultural traits exhibited in Taiwan may inhibit the transplantation of US-style human resource management such as empowerment and extensive training and development (Bae et al., 2003), the cultural transitions witnessed in recent years have given rise to a growing popularity of aspects of high performance work systems among industries in Taiwan (Chen et al., 2005; see also Cin et al., 2003 for competitive pay). Finally, as argued above, job rotation is one important HR practice that helps develop human capital. This is highly compatible with a high performance work system. Thus, it is also included as one element of the system, and its role in human capital development in industries in Taiwan is examined.

Another important driver also creates the receptivity of high performance work systems in Taiwan, which is the intensifying competitive pressure experienced by industries in Taiwan. With its relatively small territory and population of no more than 23 million, Taiwan has proved to be an insufficient size of internal market for its industries. Many companies turn to foreign markets as their major sources of income. Following a period of rapid economic growth accredited as an 'economic miracle', in recent years Taiwan has suffered economic recession. The economic competition between Taiwan and Chinese Mainland intensifies and Taiwan's competitive edge in manufacturing has weakened. Companies in Taiwan have taken a long evolutionary process toward an emphasis on research and development (R & D) and knowledge innovation in order to maintain their global competitiveness (Mathews, 2001; Wu & Hsu, 2001; Ministry of Economic Affairs, Taiwan, 2002, 2003). The changes of competitive strategies in Taiwan have strengthened the need for companies to develop their human capital for activities in R & D and knowledge innovation. The importance of high performance work systems have thus, started to be recognized, and their implementation has begun.

This study examines the effectiveness of high performance work systems, measured by organizational human capital, in the IT sector in Taiwan. This sector is particularly vulnerable to the rise and fall of economic and political conditions worldwide because of its export-oriented nature. High performance work systems have been implemented in this sector in Taiwan (Uen, 1997; Huang, 2001). This offers a promising domain from which fruitful research results may emerge. This study also seeks to examine the relationship between organizational human capital and firm performance. Further, the two organizational antecedents, namely, human resource values and organizational strategy (termed 'innovation strategy' in this article), are measured to examine their relationships with high performance work systems. Figure 1 presents our research framework.

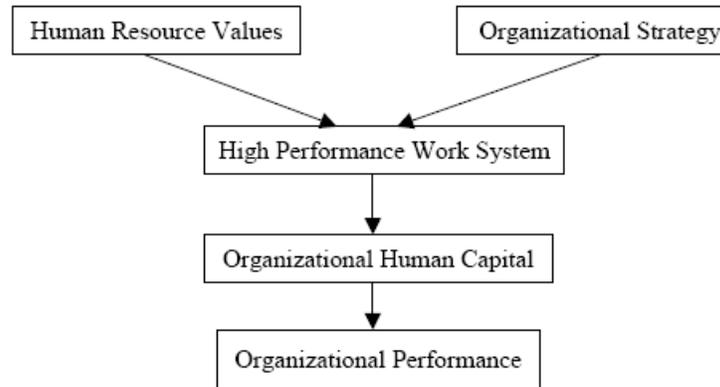


Figure 1. Research Framework

High Performance Work System and Organizational Human Capital

The discussion above has established that aspects of high performance work systems contribute to the development of organizational human capital, for example, competencies and commitment of individual human resources. The improved human capital can be observed in many ways. For example, employees may become better able to innovate, reduce cost and respond to changes in customer demands. They may identify themselves with corporate philosophies and visions, and may be more committed to organizational goals and objectives. It is fairly reasonable to predict that high performance work systems contribute to the development of organizational human capital. Therefore,

Hypothesis 1. Implementation of a high performance work system in a firm will lead to a higher level of organizational human capital.

Human Resource Values and High Performance Work System

Investment in human capital development starts from a human resource value that emphasizes human resources as the major source of competitive advantage. Past research suggests that when top management considers human capital a source of competitive advantage, it will seek to establish links to the human resource management function described as being integrative, fully-integrative, or reciprocal (Ulrich, 1997; Bae & Lawler, 2000; Noe et al., 2003). Welbourne and Andrews (1996) also discovered that when a firm values its employees in this way, it tends to have a comprehensive HRM strategy, and has better financial performance and long-term survival prospects than one which does not. Further, Bae & Lawler (2000) have demonstrated in Korean business contexts that the adoption of a new mode of HR practices starts from a change in the human resource philosophy in the upper echelon. Bartlett & Ghoshal (2002) claimed that human resource management function should be placed at the centre of strategy formulation and implementation so that human capital can be developed in order to meet the new challenges imposed by the modern business environments. Thus, we can predict that an organization whose top management values its human resources and their management will tend to commit itself in human capital development. Thus,

Hypothesis 2. A firm with a top management that values human resources and their management as sources of competitive advantage will tend to adopt a high performance work system.

Innovation Strategy and High Performance Work System

Another organizational antecedent of high performance work systems should be the strategy the firm pursues. Earlier on Sonnenfeld and Peiperl (1988) argued that an organization can be expected to exhibit one modal type of system which strongly connects with its strategy. This 'internal fit' stance, Bae & Lawler (2000) argued, is supported to some extent by studies in the field of strategic human resource management, for example Youndt et al. (1996). Although sometimes this connection was not supported (for example, Delery & Doty, 1996), extant literature tends to suggest that a differentiation strategy is more suitable for the implementation of high performance work systems than a strategy that primarily stresses cost efficiency. The purpose of high performance work systems is developing talented, multi-skilled employees to engage in innovation-based competitions in the market (Guthrie et al., 2002). Thus, high performance work systems are congruent with an organizational strategy that seeks to differentiate the company from its competitors through product or service innovation (termed 'innovation strategy' in this article). It is expected that a high quality workforce will be recruited and managed to promote the creativity, innovativeness and flexibility of the company (Edvinsson & Malone, 1997; Roos et al., 1998). Thus, the third hypothesis is,

Hypothesis 3. A firm pursuing a strategy characterized by product innovation will tend to adopt high performance work systems.

Mediating Effect of Organizational Human Capital on the Relationship between High Performance Work Systems and Firm Performance

The literature on human capital argues that human capital, as a source of sustained competitive advantage, creates high financial performance for firms. This is right at the core of Wright et al. (1994). Wright et al. and others such as Quinn (1980) argued that high quality human capital is able to sense critical environmental changes, develop effective strategies to respond to them and implement these strategies in an effective way. The flexibility and responsiveness created by knowledgeable and competent human resources offer a higher probability of success in uncertain and rapidly-changing environments (Hsu, 2006).

In human resource research, human resource practices per se are often seen as sources of a firm's competitive advantage (for example, Schuler & MacMillan, 1984, Ulrich, 1991). However, the resource-based view of the firm dictates that a resource must be valuable, rare, inimitable and non-substitutable in order to be a source of competitive advantage (Barney, 1991). While human capital can be valuable, rare, inimitable and non-substitutable, HR practices are not. Thus, we argue that human capital, as a source of competitive advantage, creates high performance. HR practices, if properly administered, help develop the human capital. Our fourth hypothesis is:

Hypothesis 4a. A firm with a higher level of human capital will tend to have higher financial performance.

Hypothesis 4a is especially important in helping to understand the 'black box' processes through which use of high performance work systems can impact on a firm's performance. Extant research indicates that high performance work systems tend to have a positive impact on a firm's performance. We have also constructed the argument that organizational human capital formation is positively impacted by high performance work system implementation (Hypothesis 1). Therefore, if organizational human capital functions as a 'black box' mechanism through which

high performance work systems have an impact on a firm's performance, then the inclusion of organizational human capital into the firm's performance equation will reduce or eliminate any impact of high performance work systems on firm performance. Of course, it would first be necessary to establish that high performance work systems, in this particular study, demonstrate an impact on a firm's performance without the inclusion of organizational human capital. Therefore,

Hypothesis 4b. Organizational human capital will mediate the relationship between firm use of high performance work systems and firm performance.

METHODS

Procedures and Sources of Data

Questionnaires were developed and sent to the 537 largest companies in information industries in Taiwan in 2003, as ranked by the Commonwealth Survey Center in 2002, a leading research centre that conducts rankings of top companies in Taiwan each year. The size of these companies implies the existence of human resource management functions and the number of engineers adequate for our survey. The questionnaire package was addressed to the attention of human resource managers. An enclosed letter explained the purpose of the study and asked for the assistance of the manager in distributing five copies of the questionnaire to randomly selected engineers for response. A total of 62 questionnaires completed by HR managers were usable. A total of 206 engineer questionnaires from 64 companies were usable.¹

The 62 HR managers averaged 38 years in age and had 14 years of work tenure, or 6.5 years of tenure within the company. The male-to-female ratio was approximately 1.26 to 1. The 206 engineers averaged 33 years in age and had 8.8 years of work tenure, or 5 years of tenure within the company. The male-to-female ratio was approximately 2.25 to 1. These engineer respondents contained 78 functional or basic-level managers.

The proportion of the companies that responded to the questionnaires was small. The profiles of the responding companies were compared against the non-responding companies with respect to annual sales, assets, capital, return on assets, profitability and number of employees. T-tests were conducted to compare these two groups (Table 1). This analysis suggested that the companies from which we obtained usable responses were significantly larger (in terms of employees, sales and capitalization) than non-respondent companies, though the two groups had similar levels of financial performance. For reasons discussed below, we believe that the results are meaningful despite the low response rate.

Table 1. A comparison of responding companies and non-responding companies. Companies that provided human resource manager data and those that did not

Profiles	Mean Values ^a	t-Values
Sales	9.1 (N1 ^b = 62)	1.5
	6.3 (N2 ^b = 475)	
Assets	14.6 (N1 = 58)	.65
	10.3 (N2 = 455)	
Capital employed	11.8 (N1 = 61)	3.18**
	30.0 (N2 = 466)	
Profitability	-0.3% (N1 = 56)	-.19
	0.2% (N2 = 441)	
Return on assets	2.4% (N1 = 56)	-.44
	3% (N2 = 440)	
No. of employees	1165 (N1 = 61)	2.67**
	504 (N2 = 431)	

** p < .01

^a Sales, assets and capital employed are in billions of New Taiwan Dollars(NTD), the exchange rate between US dollars and New Taiwan dollars is approximately 1: 33.

^b N1 represents companies that provided human resource manager data; others are represented by N2. Not every company's objective measures were available.

Companies that provided engineer data and those that did not

Profiles	Mean Values ^a	t-Values
Sales	10.8(N1 = 64)	2.6*
	6.1(N2 = 473)	
Assets	15.0(N1 = 59)	.70
	10.3(N2 = 454)	
Capital employed	12.6(N1 = 63)	3.6***
	2.8(N2 = 464)	
Profitability	-2.2%(N1 = 56)	-.89
	0.4%(N2 = 441)	
Return on assets	1.2%(N1 = 56)	-1.3
	3.1%(N2 = 440)	
No. of employees	1287(N1 = 62)	3.52***
	685(N2 = 430)	

*p < .05, *** p < .001

^a Sales, assets and capital employed are in billions of New Taiwan Dollars(NTD), the exchange rate between US dollars and New Taiwan dollars is approximately 1: 33.

^b N1 represents companies that provided human resource manager data; others are represented by N2. Not every company's objective measures were available.

Questionnaire Development

Measures of the focal constructs in this article were developed from existing literature. Two rounds of questionnaire pretesting were conducted. In the first round, five high-ranking human resource managers with more than 20 years of work experience were provided with the survey. Ambiguities and sources of confusion in the questionnaire were removed in the light of their

comments and suggestions. The second round of pretesting involved providing the revised questionnaires to a different group of 85 managers in two Executive MBA programmes in Taiwan. Seven-point Likert-type scales ranging from '1' (totally disagree) to '6' (totally agree) were used throughout the questionnaire. To avoid response bias, there was also a 'cannot answer' choice, coded as '0'. Subjective scales were used to measure four of the major constructs. Performance the firms' were assessed by objective financial measures. Appendix 1 lists our questionnaire items.

Human resource values. Human resource values refer to the degree to which top management sees human resources and human resource management as a source of competitive advantage (Butler et al., 1991). A five-item scale for this construct was adopted from Lewin & Yang (1992) by Bae & Lawler (2000), and was applied to HR managers. This scale has been shown to have a good psychometric property in Bae & Lawler (2000). For the survey of engineers, one item, designated in the appendix, was removed from the initial five items because engineers had difficulty answering it.

Innovation strategy. Innovation strategy measured the degree to which the company seeks to achieve differentiation in the market through product or service innovation. A seven-item scale was developed from Miller's measurement of innovative differentiation (1988), that is, Porter's (1980) differentiation strategy that emphasizes product innovation, and was implemented in the questionnaire for human resource managers. For the survey on engineers, three items were removed from the initial seven items with a concern that engineers had difficulties answering them.

High Performance Work Systems. Measures of selective recruitment, training and development, performance-based pay, and competitive pay were adopted from Snell & Dean (1992) and Bae & Lawler (2000). Measures of empowerment were adopted from Bae & Lawler (2000). Drawn from a range of studies (Bird, 1994; Campion et al., 1994; Cheraskin & Campion, 1996), job rotation was measured by a three-item scale. The items measuring high performance work systems were identical in the questionnaires sent to human resource managers and engineers.

Organizational Human Capital. A six-item scale of organizational human capital was developed by reference to a range of studies (Snell & Dean, 1992; Delaney & Huselid, 1996; Edvinsson & Malone, 1997; Roos et al., 1998; Youndt et al., 2004). The scale contained both aspects of competence and commitment of individual human resources as constituents of organizational human capital. The items measuring human capital were identical between the questionnaire for human resource managers and that for engineers.

Control Variables. The control variables used here included size of firm and industry. Size of firm was defined as the natural logarithm of the number of fulltime employees (Blau & Schoenherr, 1971; Snell, 1992). According to Child (1974) and Kimberly (1976), size of firm may show a curvilinear relationship with structural complexity. This logarithmic scale is also used to normalize the size variable, which might otherwise be badly skewed (Miller & Droge, 1986). Industry was a dummy variable with manufacturing coded as 1 and service as 0.

RESULTS

Reliability and Validity Issues

Due to a relatively small sample size, companies that responded to our survey were examined using return on assets, profitability and log of number of employees. It was found that no

company cases or cluster of company cases fall outside plus or minus three standard deviations from the mean for any of the three measures. The reliabilities for the four subjective scales, namely, human resource values, innovation strategy, high performance work systems, and human capital, were assessed. For our human resource manager data, the coefficient alpha ranged from 0.87 to 0.96. For engineer data, the coefficient alpha ranged from 0.72 to 0.96. The reliability tests showed acceptable reliability for both data-sets. Descriptive statistics and bivariate Pearson correlations for the four scales are presented in Table 2. The composite high performance work system scale contains six sub-scales, selective recruitment, training and development, empowerment, performance-based pay, competitive pay and job rotation. Their descriptive statistics are shown in Table 3.

Table 2. Descriptive statistics and correlations.

Human resource manager data

Variable	Mean	s.d.	α	1	2	3
1. Human resource values	4.00	1.02	.87			
2. Innovation strategy	4.15	1.15	.91	.76		
3. High performance work systems	4.11	.89	.96	.81	.80	
4. Organizational human capital	4.26	.97	.93	.61	.70	.84

N = 62. Correlations are significant at .01 level.

Engineer data

Variable	Mean	s.d.	α	1	2	3
1. Human resource values	3.69	.92	.72			
2. Innovation strategy	4.18	1.03	.83	.63		
3. High performance work systems	3.78	.87	.96	.74	.70	
4. Organizational human capital	4.27	.89	.89	.51	.62	.65

N = 206. Correlations are significant at .01 level.

Hypothesis Testing

In order to avoid common method variance, the two data-sets containing the questionnaires of both human resource managers and engineers were used interchangeably for subsequent statistical analysis. As many of our companies provided more than one engineer to respond to our questionnaires, this individual level data was aggregated to arrive at the company-level data for hypothesis testing. Interrater reliability tests were conducted for these companies. The average ICC (intra-class correlation coefficients) values are consistent with the various study results reported by Gerhart et al. (2000) and Wright et al. (2001). According to these studies, a generally low level of inter-rater reliability was found among human resource managers within a company. Hence, the engineer data can be best viewed as an index of varying perspectives within the organization rather than an internally homogeneous scale. Of course, the relatively low interrater reliabilities would generally tend to bias our findings toward rejection of our primary hypotheses. Thus findings supporting those hypotheses can be viewed as robust. In addition, we have used the engineer data to cross-validate the findings from the human resource manager data. Appendix 2 reports the ICC values.

Hypotheses 2 and 3 postulate relationships between the two constructs, human resource values and innovation strategy, and high performance work system implementation. These were tested by linear regression analysis. The results are presented in Table 4. For these two tests, data of the 49 companies that provided both human resource managers and engineer accounts of our focal constructs were used. Mean company values for the high performance work system scales derived from engineer data and company-specific responses concerning human resource values and innovation strategy provided by human resource managers were used. The use of the two data-sets in hypothesis testing reduced the possibility of common method variance.

Table 3. Descriptive statistics for sub-scales of high performance work systems

Human resource manager data

Variable	Mean	s.d.	α
1. Selective recruitment	4.15	.93	.85
2. Training and development	4.23	1.01	.92
3. Empowerment	4.05	1.02	.87
4. Performance-based pay	4.06	1.16	.78
5. Competitive pay	4.12	1.08	.86
6. Job rotation	3.92	1.08	.92

N = 62

Engineer data

Variable	Mean	s.d.	α
1. Selective recruitment	3.95	.94	.86
2. Training and development	3.91	.99	.89
3. Empowerment	3.76	1.00	.77
4. Performance-based pay	3.65	1.13	.85
5. Competitive pay	3.61	1.15	.86
6. Job rotation	3.42	1.15	.93

N = 206

Table 4. Results of regression analysis for high performance work systems

Variable	High performance work systems ^a	
	Model 1	Model 2
Human resource values ^b		.32(1.66) ⁺
Innovation strategy ^b		.11(.59)
Industry	– .27(– 1.73) ⁺	– .26(– 1.77) ⁺
Log of number of employees	.27(1.69) ⁺	.18(1.20)
Adjusted R square	.04	.17
F	2.07	3.37*
<i>df</i>	2, 45	4, 42

⁺p < .10, * p < .05

^a Based on engineer responses

^b Based on human resource manager responses

First of all, we included only the industry dummy variable and organizational size (number of employees) as control variables. The results were weak and the overall equation was not statistically significant. The addition of the two variables related to Hypotheses 2 and 3, however, substantially increased the explanatory power of the model. Assessing the significance of these effects was complicated by the small sample size and collinearity problems, as the correlation between human resource values and innovation strategy was high ($r = 0.76$). With small samples and collinearity issues, it is appropriate to look at the overall effect of the addition of the variables in question on the explanatory power of the model. The change in adjusted R^2 associated with the addition of these two variables was 0.13. The partial F-value was significant at the 0.02 level ($F_{2, 42} = 4.48$). In addition, the parameter estimates were positive in both instances, as predicted by Hypotheses 2 and 3. Thus, even though the individual parameter significance levels are low (especially for innovation strategy), the joint effects of these two variables are quite strong. It is difficult, because of the collinearity problems, to disentangle these effects, but we can see that jointly there is at least some level of support for both Hypotheses 2 and 3, as the joint effect of the two variables was high and each parameter is of the hypothesized sign.

Hypothesis 1 postulates a positive relationship between high performance work systems and organizational human capital. To test this hypothesis, the same matched data-set derived from the 49 companies was used. The test results are presented in Table 5. Model 4 reports linear regression results using engineer data. Although adjusted R^2 seems acceptable, possibilities of common method variance may still have been present. We decided to conduct another linear regression analysis presented by Model 5, where mean values of organizational human capital derived from engineers' data were regressed against those of high performance work systems derived from human resource manager data. The results reported in Model 5 corroborated those of Model 4, so Hypothesis 1 is supported.

Table 5. Results of regression analysis for organizational human capital

Variable	Organizational human capital ^a		
	Model 3	Model 4	Model 5
High performance work systems ^a		.76(7.73) ^{***}	
High performance work systems ^b			.41(3.03) ^{**}
Industry	-.31(-2.0) [*]	-.11(-1.01)	-.33(-2.27) [*]
Log of number of employees	.54(.60)	-.12(-1.10)	.02(.11)
Adjusted R square	.04	.59	.19
F	2.05	23.09 ^{***}	4.68 ^{**}
df	2, 45	3, 44	3, 44

⁺p < .10, * p < .05, **p < .01, ***p < .001

^a Based on engineer responses

^b Based on human resource manager responses

Hypotheses 4a, and 4b postulate the effect of organizational human capital on firms' performance and its mediating effect on the relationship between high performance work systems and firms' performance.² In testing these hypotheses, we have done separate analyses using both the human resource manager data and the engineer data (Table 6). That the findings are similar in both cases serves to cross-validate the findings. With regard to Hypothesis 4a, the inclusion of organizational human capital in the analysis (Models 9 & 16) increases firms' performance, consistent with Hypothesis 4a. In addition, if we include high performance work systems in the equation without organizational human capital, it exerts a positive impact on firm performance (Models 10 & 17), as would be anticipated. However, when both of these variables are included in the analysis (Models 11 & 18), the impact of high performance work systems on firms' performance is greatly diminished (in fact, becomes statistically insignificant), and the impact of organizational human capital remains positive and significant. This finding supports the mediating relationship posited in Hypothesis 4b and suggests that organizational human capital formation is one mechanism through which human resource systems have an impact on firms' performance.

We recognize, of course, that collinearity problems might be seen to explain these findings, as in the case of Hypotheses 2 and 3. The correlation between high performance work systems and human capital is also relatively high ($r = 0.84$ for human resource manager data; $r = 0.65$ for engineer data) and the joint effect of the addition of these two variables is also high. However, the difference is that there is a sign shift in the high performance work system variable (from positive to negative) with the addition of human capital to the Equation (and collinearity only biases standard error estimates, not parameter estimates – Models 10 and 11, and Models 17 and 18). This negative sign is not consistent with any theoretical expectation. In addition, if we compare Models 9 and 16 (with only the human capital variable added) to Models 10 and 17 (with only the high performance work system variable added), it is evident that human capital by itself has a much greater impact on firms' performance (in terms of R^2 change) than high performance work systems. So the evidence here is quite suggestive of the impact of high performance work systems in this setting operating through enhanced human capital. Thus, we conclude that Hypotheses 4a and 4b are supported.

Table 6. Results of regression analysis for firm performance (human resource manager data)

Variable	Firm Performance											
	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12					
Organizational human capital			.50(2.92)**	.50(3.80)*	.35(2.33)*	.70(3.02)**	.81(3.44)**					
High performance work systems						-.26(-1.06)	-.48(-1.57)					
Innovation strategy		.33(2.19)*	.01(.06)				.16(.75)					
Industry	-.04(-.24)	-.05(-.33)	-.13(-.91)	-.12(-.86)	-.11(-.70)	-.10(-.72)	-.14(-1.01)					
Log of number of employees	-.28(-1.73) ⁺	-.38(-2.31)*	-.29(-1.87) ⁺	-.29(-2.1)*	-.35(-2.26)*	-.25(-1.66)	-.20(-1.41)					
Adjusted R square	.04	.12	.26	.28	.14	.28	.26					
F	2.01	2.99*	4.80**	6.59**	3.29*	5.23**	4.04**					
df	2, 42	3, 40	4, 39	3, 41	3, 41	4, 40	5, 38					

⁺p < .10, *p < .05, **p < .01

Table 6. (Continued).

Variable	Firm Performance								
	Model 13	Model 14	Model 15	Model 16	Model 17	Model 18	Model 19		
Organizational human capital									
High performance work systems									
Innovation									
strategy									
Industry									
Log of number of employees									
Adjusted R square	.01	.11	.17	.19	.08	.17	.16		
F	1.25	2.73 ⁺	3.25 [*]	4.38 ^{***}	2.18	3.24 [*]	2.59 [*]		
df	2, 41	3, 40	4, 39	3, 40	3, 40	4, 39	5, 38		

⁺p < .1, * p < .05, ** p < .01

Discussion

This study has provided evidence that supports the importance of organizational human capital. Consistent with the study conducted by Youndt & Snell (2004) in the USA, human resources with competencies and commitment contribute to a firm's financial performance. Previous research claimed that the 'black box' mediating between human resource management practices and performance is not well understood (Wright & Gardner, 2000; cf. Becker et al., 1997). Our research has offered one possible opening into that black box, which is organizational human capital. High performance work systems by themselves do not directly contribute to high financial performance. Rather, these practices improve the competencies and commitment of employees who are willing to exert their efforts for the benefits of the organization. Thus, our findings provide evidence of a causal link between human resource management practices and firm performance through organizational human capital. In particular, the low interrater reliability may suppress an otherwise significant relation between variables. Our data analysis suggests that the hypothesized relationships are significant, and demonstrates the robustness of our findings.

As reported above, we examined the joint effect of human resource values and innovation strategy on high performance work system implementation, and the joint effect can be said to exist. The joint effect suggests a theoretical implication: both human resource values and innovation strategy are two antecedents for the implementation of high performance work systems in IT industries in Taiwan. This finding is generally consistent with previous literature, for example, Bae and Lawler's (2000) empirical study in South Korea. This study facilitates construction of a model of human capital development through high performance work system in Asia-Pacific regions. Such a model should include both human resource values and innovation strategy as two antecedents for high performance work system implementation.

Previous literature suggests a significant and positive relationship between innovation-oriented business strategy and high performance work system implementation (Bae & Lawler, 2000). This was not found in this study. A possible explanation is that in Taiwan, management practices are more heavily influenced by managerial perceptions and style, which have a basis in its national cultural norms (Bond & Hwang, 1986; Yavas & Rezayat, 2003), than other organizational antecedents such as strategy. Thus, the positive but relatively weak association between innovation strategy and high performance work systems requires further investigation. Such an investigation will also help in understanding the concept of 'fit' or consistency between organizational strategy and human resource management practices (for example, Arthur, 1992; Huselid, 1995; Bae & Lawler, 2000; Bae et al., 2003) in industrial contexts in Taiwan.

Moreover, our efforts in triangulation, namely, use of engineer perceptions to cross-validate those of human resource managers; have strengthened our findings (cf. Rogers & Wright, 1998; Wright et al., 2001). Although researchers have argued the importance of internal stakeholders in their evaluation of human resource policies and practices (for example, Ulrich, 1997; Noe et al., 2003), studies in the human resource management field have rarely used internal stakeholders such as engineers to cross-validate human resource managers' perspectives (Lin et al., 2004). Similar research methodologies are encouraged for future study that follows the line of enquiry reported in this article.

Implications

This essay results in implications for theory and practice. In theory, previous literature has examined links between human resource management practices and firms' performance. This study offers to provide a causal mechanism between an important type of human resource

management practice, that is, high performance work systems and firms' performance. That is, high performance work systems do not directly contribute to firms' performance. Rather, a firm's performance is improved when organizational human capital is developed, following the implementation of high performance work systems. Our research contributes to the model building effort in Asia-Pacific regions in the domain of research that seeks to establish the link between human resource management practices and firms' performance.

In practice, the effectiveness of human resource management practices should not only be examined by bottom line figures, which can be too late, but also by organizational human capital. This article has demonstrated that high performance work systems are effective in developing organizational human capital. Also the importance of organizational human capital cannot be stressed too highly as it is a crucial source of an organization's competitiveness. Finally, top managers in IT industries in Taiwan must see organizational human capital as a major source of a firm's effectiveness and competitive advantage, and, at the same time, adopt an innovation strategy before high performance work systems are implemented.

Limitations and Future Directions

This study is clearly exploratory. It is increasingly difficult to gain access to companies for empirical data in Taiwan. The small sample size and the particular size of the companies found in a particular industry may have posed major limitations to this investigation. Also, the t-tests showed our respondent companies are significantly larger in terms of employees, capital employed and sales. Given these limitations, the findings in this study are not conclusive but suggestive, and cannot be generalized to all kinds of companies, including small and medium sized ones. Future studies are encouraged to follow the line of enquiry reported in this article to establish generalization of findings.

Also, the low interrater reliability among respondents may suppress an otherwise significant relation between variables. This can be evident in the innovation strategy-HPWS relationship. Future research will be needed to continue to examine this relationship in the industrial context of Taiwan. The studies will provide insights into the nature of the relationship in this industrial context.

Finally, the relationship between organizational human capital and firms' performance needs further investigation. For example, existing studies indicate a curvilinear relationship between organizational human capital and firms' performance (Hitt et al., 2001). That is to say, to acquire and develop human capital can be costly, and managers may not have the necessary skills to manage it at the outset. Human capital may not bring satisfactory returns to offset the costs incurred (Snell & Dean, 1992; Schwab, 1993). Its positive effect can only become salient through time when other forms of capital also develop, such as social capital (Nahapiet & Ghoshal, 1998; Hitt et al., 2001), or social capital and structural capital (Edvinsson & Malone, 1997; Bontis & Fitz-ens, 2002). Exactly how this co-developmental process leads to a firm's performance needs to be studied in the future.

Conclusion

An important issue that gradually receives researchers' attention concerns the black box mediating between human resource management practices and firms' performance. Although recognized, this issue has not been studied in Taiwan. Over the past decade, companies in Taiwan have faced formidable challenges caused by the competition imposed by emerging economies in the region and the trend of globalization. Thus, the focal issue should be studied in order to

address firms' competitiveness in Taiwan. This article reports such a study. The findings demonstrate the mediating effect of organizational human capital on the relationship between high performance work systems and firms' performance. The findings also suggest a joint effect of both top management human resource values and innovation strategy on the implementation of high performance work systems. Although exploratory in nature, this study suggests the importance of organizational human capital and presents a causal mechanism as to how high performance work systems can lead to the high financial performance of firms in Taiwan.

Notes

¹ Two rounds of mailing resulted in 77 companies responding to our survey with usable questionnaires. Not every company provided both HR manager and engineer responses, only 49 out of the 77 companies provided a matched data-set.

² However, financial data from some companies was not available to the researchers. Of the 62 companies that provided usable human resource manager data, 47 provided financial data (profitability in 2004 was used in the linear regression analysis). Of the 64 companies that provided engineer data, 45 provided financial data (return on assets in 2004 was used in the linear regression analysis).

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Appendix 1: Measurement

Organizational Human Capital

1. Our employees identify themselves with company values and vision.
2. Our employees exert their best efforts to achieve organizational goals and objectives.
3. Our employees are better at innovation and R & D than those of competitors.
4. Our employees are better than those of competitors at interpreting the environmental trends for sustaining the company’s competitive advantage.
5. Our employees are better than those of competitors in responding to customer demands for sustaining the company’s competitive advantage.
6. Overall speaking, our company’s employees outperform competitors’.

Human Resource Values

1. Top management of our company puts much emphasis on human resource issues in the company.

2. Top management of our company considers human resource policies and practices to be contributive to company performance.
3. Top management of our company regards profit making as more important than developing human resources of the company (reverse-scored).
4. Top management of our company considers the person in charge of human resources as a strategic partner in formulating and implementing business strategy.*
5. Top management of our company regards human resources and human resource policies and practices as sources of the company's competitive advantage.

Innovation Strategy

1. Our company regards innovation as the key to perpetual survival.
2. Our company is always one step ahead of its competitors in introducing new products or services to the market.
3. If our company is one step ahead of its competitors in introducing new products or services to the market, they always become good competitive weapons.
4. The company pursues its own successful business model.
5. In the past three years, our company has higher R & D expenses as a percentage of sales than its competitors.*
6. In our company, products or services introduced to the market within the last three years have higher sales than other products or services.*
7. In the past three years, our company's costs of product (or service) introduction or new market development are higher than those of competitors.*

High Performance Work Systems

Selective recruitment

1. Our company spends a great amount of money in recruiting top talents.
2. Our company uses extensive procedures in recruitment and selection, including a variety of tests and interviews.
3. Our company makes every effort to attract the best person for a given important position.
4. In recruiting, our company emphasizes the potential of new hires.
5. In recruiting, our company has been able to attract better applicants than competitors.
6. Managers try their best to hire even more qualified people than they themselves.

Training and development

1. Our company has a good mentoring system to support new hires.
2. Managers initiate and provide various kinds of training and development for their employees.
3. Overall speaking, company provided training and development has been effective in enhancing employees' job performance.
4. Our company systematically evaluates employees' training results.
5. Our company regards employee training as an investment rather than a cost.
6. Our company makes sure its employees have multiple skills and can work in differing job areas.

Empowerment

1. Our company has minimum status differentials (e.g., sharing of car park and restaurants between managers and employees, etc.).
2. Employees are invited to participate in problem solving and decisions.

3. Our company transfer extensively differing tasks and responsibilities to employees.
4. Employees are invited to participate in a wide range of issues, including performance standards, quality improvement, benefits, etc.

Performance-based pay

1. Our company's performance evaluation systems make our employees consistently exploit their work potentials.
2. Our company's pay systems reflect every employee's contribution to the company.
3. When our employees are promoted, their work performance is more important than their tenure in the company.

Competitive pay

1. Our company is willing to offer a competitive compensation package, even way ahead of the pay scheme, in order to attract a talented person.
2. Overall speaking, our compensation is competitive in comparison to those of competitors.
3. In general, our compensation package induces employees' commitment and contribution.

Job rotation

1. Our company emphasizes employees' job rotation in different work areas.
2. Job rotation of our company's employees enhances their career prospect.
3. Job rotation of our company's employees is conducted in line with its future development.

Note: Items followed by asterisks are those not appearing on engineer-version questionnaires.

Appendix 2: ICC Values of Companies that Provided at least Two Engineer Responses

On average, intraclass correlation coefficients (ICC) for the four constructs were: human resource values: 0.03, innovation strategy: 0.17, high performance work systems: 0.18, and human capital: 0.19. In order to arrive at the best possible interrater reliability, we went through a long process of deleting outliers using the statistical software package, SPSS 11.0 version, for companies providing at least three engineer responses. New mean ICC values in the four constructs were: human resource values: 0.24, innovation strategy: 0.33, high performance work systems: 0.23, and human capital: 0.30. However, the improvement of interrater reliability seems to be limited. Further, the rich information that could have been provided by the original engineer data would be substantially reduced were large numbers of questionnaires to be disregarded in the following analysis. This may render our research findings somewhat contrived. We decided to retain all the 206 engineer questionnaires for further analysis.