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EFFECTS OF HUMAN RESOURCE SYSTEMS ON MANUFACTURING PERFORMANCE AND TURNOVER

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Using an empirical taxonomy identifying two types of human resource systems, "control" and "commitment," this study tested the strategic human resource proposition that specific combinations of policies and practices are useful in predicting differences in performance and turnover across steel "minimills." The mills with commitment systems had higher productivity, lower scrap rates, and lower employee turnover than those with control systems. In addition, human resource system moderated the relationship between turnover and manufacturing performance.

Long a concern among organizational contingency theory researchers, the concept of the congruence, or fit, between diverse sets of organizational policies and practices has recently emerged as an important subject of study for human resources management researchers. This new strategic, macro, human resource management perspective differs markedly from the more traditional approach focusing on the effects of separate human resource practices on individual-level outcomes (Butler, Ferris, & Napier, 1991; Jackson, Schuler, & Rivero, 1989; Mahoney & Deckup, 1986; Snell, 1992). In contrast, the strategic human resource management perspective integrates macro-level theories and concepts to explore the impact of specific configurations, or systems, of human resource activities on organization-level performance outcomes (Dyer & Holder, 1988; Fisher, 1989; Wright & McMahan, 1992).

Dobbins, Cardy, and Carson pointed out that although a macro approach to studying human resource issues appears promising and conceptually very rich, "the validity of its propositions is ultimately an empirical question" (1991: 33). Empirical evidence demonstrating the predictive value of the strategic human resource perspective, however, has not been forthcoming. Conceptual typologies abound in this literature, but empirically based taxonomies of human resource strategies are rare. As a result, basic hypotheses concerning the implications for firm performance that flow from the strategic human resource perspective have generally not been tested. A recent

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review of strategic human resource management, for example, concluded that "there is little empirical evidence to suggest that strategic HR directly influences organizational performance or competitive advantage" (Lengnick-Hall & Lengnick-Hall, 1988: 468).

In this study, I addressed this important gap in the existing literature by empirically testing specific organizational performance hypotheses flowing from a strategic human resource management perspective. To accomplish this, I drew on the results of a previous study that used a cluster analysis technique to empirically identify two types of human resource systems, labeled "control" and "commitment" systems, in a sample of steel minimills (Arthur, 1992).[1] I developed and tested propositions regarding the utility of this human resource system taxonomy for predicting both manufacturing performance, measured as labor efficiency and scrap rate, and the level of employee turnover in steel minimills. In addition, I tested the proposition that the relationship between turnover and manufacturing performance differs significantly across the two systems.

THEORETICAL DEVELOPMENT AND HYPOTHESES

Testing the strategic human resource perspective first requires categorizing organizations into a meaningful typology of human resource systems. Using the strategic perspective, a number of authors have suggested typologies (e.g., Dyer & Holder, 1988; Miles & Snow, 1984; Osterman, 1987; Schuler & Jackson, 1987; Walton, 1985). Underlying the use of these typologies is the proposition that organizations differ in their basic approaches or objectives in managing human assets. These objectives, often stated in terms of desired employee characteristics, attitudes, and behaviors, are (or should be) derived from a firm's overall business goals and may be moderated by factors internal and external to the organization (Schuler, 1992; Wright & McMahan, 1992). However, because these typologies have not been consistently measured, their validity and predictive power have not been assessed.

Control and Commitment Human Resource Systems

My earlier research (Arthur, 1992) is one of the first published attempts to develop an empirical classification of firms based on human resource system characteristics. Applying a cluster analysis technique to data from human resource managers, I found that the variety of human resource policies and practices in 30 U.S. steel minimills could be meaningfully described by six clusters, or systems. Further, I grouped those systems into two broad categories based on their characteristics and the functions they served and labeled them "cost reducers" and "commitment maximizers." To maintain consistency with previous research on human resource strategy (Lawler,

[1] Minimills are relatively small steel-producing facilities in which metal scrap is melted in electric furnaces and continuously cast into a variety of shapes and grades of steel. Detailed discussion of minimills can be found in Barnett and Crandall (1986) and Hogan (1987).

1986; Walton, 1985), I have labeled those systems "control" and "commitment" in this study.

Control and commitment represent two distinct approaches to shaping employee behaviors and attitudes at work. The goal of control human resource systems is to reduce direct labor costs, or improve efficiency, by enforcing employee compliance with specified rules and procedures and basing employee rewards on some measurable output criteria (Eisenhardt, 1985; Walton, 1985). In contrast, commitment human resource systems shape desired employee behaviors and attitudes by forging psychological links between organizational and employee goals. In other words, the focus is on developing committed employees who can be trusted to use their discretion to carry out job tasks in ways that are consistent with organizational goals (e.g., Organ, 1988).

The control and commitment approaches to human resource management are expected to be represented by different sets of programs and practices. In my previous research (Arthur, 1992) I found that in general, commitment human resource systems were characterized by higher levels of employee involvement in managerial decisions, formal participation programs, training in group problem solving, and socializing activities and by higher percentages of maintenance, or skilled, employees and average wage rates. The present study's methods section presents further details of these system patterns.

The existence of the control and commitment variations in organizations is generally thought to be associated with certain organizational conditions. Most human resource strategy researchers have taken a behavioral perspective (cf. Snell, 1992). Research using this perspective rests on the often implicit assumption that the successful implementation of a business strategy requires a unique set of employee behaviors and attitudes and that a unique set of human resource policies and practices will elicit those behaviors and attitudes (Cappelli & Singh, 1992). Alternatively, control theory researchers (e.g., Eisenhardt, 1985; Ouchi, 1979; Snell, 1992) have noted that the use of a control system depends on managers having a relatively complete knowledge of the transformation process (inputs to outputs) and a high ability to effectively set performance standards and measure employee outputs. These conditions enable employers to directly monitor and reward employee behavior or the specific outcomes of that behavior. In the absence of these conditions, an input, or clan, system is predicted, in which selection, training, and socialization policies that try to align employee interests with those of the firm are emphasized (Eisenhardt, 1985).

Hypotheses

Human resource systems and manufacturing performance. Although the above theoretical approaches suggest a contingency view of human resource system effectiveness, there are a number of reasons to believe that a smoothly functioning commitment human resource system will be associated with higher organizational performance than will a control system, the more traditional human resource approach in manufacturing (Walton, 1985). By decentralizing managerial decision making, setting up formal participation mechanisms, and providing the proper training and rewards, a commitment system can lead to a highly motivated and empowered work force whose goals are closely aligned with those of management (Thomas & Velthouse, 1990). Thus, the resources required to monitor employee compliance, such as those needed to maintain supervision and work rules, can be reduced (Locke & Schweiger, 1979). In addition, employees under these conditions are thought to be more likely to engage in organizational citizenship behaviors (Organ, 1988), nonrole, unrewarded behaviors that are believed to be, nonetheless, critical to organizational success (e.g., Katz, 1964).

A parallel set of arguments on the superior performance of commitment systems can be found in the recent industrial relations literature (e.g., Kochan, Katz, & McKersie, 1986). Management's attempt to implement a classic control system for reducing labor costs by unilaterally increasing performance standards and maintaining wages and benefits is likely to be met by strong resistance from a unionized work force. Resistance in the form of strikes, high grievance rates, and adversarial labor relations have been found to be extremely costly to firms in terms of productivity and quality (Cooke, 1992; Katz, Kochan, & Weber, 1985).

Finally, although there continues to be debate concerning the conditions under which the participative management practices associated with commitment systems are effective (e.g., Levine & Tyson, 1990; Locke & Schweiger, 1979), recent evidence suggests that these practices are especially critical for the effective implementation and utilization of advanced manufacturing technology (Majchrzak, 1988; Dean & Snell, 1991). The present study focused specifically on manufacturing performance, defined by two production-process-related measures of organizational effectiveness, labor efficiency and scrap rate. These performance outcomes are predicted to be most directly affected by differences in employee behaviors and characteristics as shaped by systems of human resource activities.

> *Hypothesis 1: Plants with commitment human resource systems will have better manufacturing performance than plants with control human resource systems.*

Human resource systems and turnover. A vast literature exists on the determinants of employee turnover, long considered an important outcome for both individuals and organizations. Most of this research has focused on individual-level variables, such as employees' satisfaction with their jobs and their organizational commitment (e.g., Cotton & Tuttle, 1986). In this work, I tested the proposition that organization-level human resource characteristics are also significantly related to the overall turnover in firms, expecting higher turnover in organizations with control systems than in those with commitment systems.

The basis for this prediction is the different objectives of control and commitment systems as manifested in different combinations of human resource policies and practices. As noted above, the driving force behind a control system is to reduce direct labor costs. This goal is expected to be manifested in the use of relatively simple, well-defined job tasks. Because employees with a minimum amount of training and experience can perform such tasks, wages and the costs of employee search, selection, and training can also be minimized. Under these conditions, the costs of employee turnover to a firm are expected to be relatively low, so employers have very little incentive to try to minimize turnover through human resource policies and policies designed to increase employee commitment or attachment. In fact, employee commitment might be considered dysfunctional since compensation is generally higher for senior employees than for similarly qualified new employees.

Hypothesis 2: Turnover will be higher in control human resource systems than in commitment human resource systems.

Turnover and manufacturing performance. Since the late 1970s, research on the consequences of employee turnover has generally compared the cost and performance of individuals who leave an organization with those of (1) their replacements, (2) those who stay with the organization, or (3) both (e.g., Boudreau & Berger, 1985; Hollenbeck & Williams, 1986). A potential limitation of this approach is that the effect of organizational context is largely ignored. In other words, the departure of an individual with a given level of assessed performance is assumed to have the same effect on organizational performance across organizations.

In contrast, the human resource strategy perspective suggests that the effect of turnover level on organizational performance depends critically on the nature of the context or system in which the turnover occurs (cf. Miller & Friesen, 1984). System characteristics can be seen as affecting the performance impact of a number of the predicted consequences of turnover, such as disruption of social and communication structures, training and assimilation costs, and decreased cohesion and commitment of members who stay (Dalton & Todor, 1979; Mobley, 1982; Staw, 1980). For example, the fact that the jobs in organizations with commitment systems often require high training and skill levels suggests a stronger relationship between organizational tenure and performance than exists in control systems. Individuals in such jobs will take longer to reach top performance than individuals in the simpler jobs of control systems (Campion, 1989).

In addition, because production employees in commitment systems take on more managerial-level decision-making tasks, their organizational centrality, and hence the potential for their departure to disrupt organizational functioning, is expected to be greater than the disruptive potential of the typical employee in a control human resource system who does not have these vertical task responsibilities.

Hypothesis 3: There will be a stronger negative relationship between turnover level and manufacturing perfor-

mance in commitment human resource systems than in control human resource systems.

METHODS

The data used for this study come primarily from questionnaire responses by human resource managers at 30 of the 54 existing U.S. steel minimills. Data were gathered between November 1988 and March 1989. The average age, size, geographic region represented, and union status of the mills surveyed are not statistically different from those of the total minimill population (Arthur, 1992).

The modal minimill firm is an independent, privately held U.S. firm that owns one minimill. There are, however, a growing number of larger domestic (and some foreign) companies that own multiple plants (Hogan, 1987). Because of the possibility that a manager's scope of responsibility might span several mill locations, managers were specifically instructed to direct their comments only to the mill location to which the questionnaire was addressed. In addition, a different set of managers provided data for each mill so that in no case were data from more than one mill collected from a single manager.[2]

Measures

Minimill human resource systems. In Arthur (1992), I used the minimill questionnaire data to construct ten variables measuring various aspects of mills' workplace human resource systems. Table 1 defines these variables, which I standardized and submitted to a cluster analysis using Ward's method in order to empirically identify the minimill human resource systems. This procedure yielded a six-cluster solution based in part on an analysis of the change in the fusion coefficient, defined as the error sums of square for this procedure (Arthur, 1992: 504).

Theoretical considerations, such as a desire to test for differences between two dominant human resource systems, and sample size limitations (degrees of freedom were not available to include all six clusters in the analysis) required some additional data aggregation. I accomplished this by categorizing the patterns of cluster scores into control and commitment systems. As reported in my previous study, this judgment was informed by descriptions of alternate forms of control and commitment human resource systems found in the relevant literature as well as by detailed primary and secondary case descriptions of the mills.

Conceptually, this method of data aggregation is consistent with the

[2] Some recent studies have found that different human resource practices may be applied to different occupational and functional groups within firms (Jackson et al., 1989; Snell & Dean, 1992). Because this study only focused on the maintenance and production workers in minimills, I could not assess the possibility that different sets of human resource activities were applied to other functional and occupational groups in the organizations.

TABLE 1
Description of Human Resource Variables and Comparison of Means for Control and Commitment Systems[a]

Variables		Control		Commitment			
Name	Description	Means	s.d.	Means	s.d.	t^b	α
Decentralization	Degree to which nonsupervisory employees monitor data on quality, costs, productivity, and scrap; determine work flow or order of tasks; invest in new equipment and technology; develop new products (1 = very little, 6 = very much)	2.42	0.72	3.04	1.16	1.76*	.778
Participation	Percentage of mill employees who received training in group problem solving, meet on a regular basis in small groups to discuss production or quality problems, or are involved in joint union-management or employee-management committees	36.57	29.54	52.42	26.70	1.51	.707
General training	Part of general training and development activities for production and maintenance employees accounted for by seminars, classes, training not directly related to employees' immediate work area; general skills training not directly related to the employee's current job; or people skills training such as communication or group problem solving (1 = no part, 6 = large part)	1.92	0.76	3.35	1.42	3.35**	.770
Skill	Number of maintenance and craft workers as a percentage of all mill employees	0.14	0.02	0.19	0.03	4.51**	
Supervisor	Number of production workers per supervisor	7.05	3.29	6.13	1.55	1.01	
Social	Number of times per year management organizes social gatherings for employees, such as company picnics and bowling	3.94	3.23	7.31	11.13	1.06	
Due process	Percentage of total employee complaints or grievances that are handled through formal grievance procedures involving several steps, up to and including binding third-party arbitration	20.56	33.28	26.18	25.52	0.51	
Wages	Average total employment cost per production and maintenance worker, including wage rate, benefits, bonus or incentive payments, and taxes	18.07	3.05	21.52	2.78	3.11**	
Benefits	Percentage of total average employment cost accounted for by employee benefits	27.31	9.70	32.01	8.91	1.37	
Bonus	Percentage of total average employment cost accounted for by bonus or incentive payments	29.96	21.43	13.62	7.94	2.58**	
Percentage unionized		38		57			

[a] $N = 16$, control; $N = 14$, commitment.
[b] One-tailed tests; approximation t-test for unequal sample variances were used when indicated by a significant F-test.
* $p < .05$
** $p < .01$

systems concept of "equifinality," according to which the same end (control or commitment) can be achieved by multiple means (configurations of human resource policies and practices) depending on specific organizational constraints. The categorization procedure also allows for the possibility of interpreting an individual variable or set of variables differently depending on its overall pattern or context (cf. Miller & Friesen, 1984). This freedom is especially useful for interpreting a variable such as due process (see Table 1), which means different things in union and nonunion contexts (Arthur, 1992). By examining the complete pattern of scores as well as the union status of the different clusters, I could identify human resource cluster patterns that were consistent with the descriptions of alternate forms (union and nonunion) for achieving cost control and employee commitment found in the human resource and industrial relations strategy literature.

As Table 1 shows, the pattern of scores for the aggregated clusters shows considerable face validity, appearing to match the descriptions of control and commitment systems provided earlier. All the mean differences between the two cluster groupings are in the predicted directions. In particular, the average scores on measures of decentralizing decision making, generalized training, skill, and wage rate are all significantly higher in commitment systems than in control systems. The value of the bonus variable is significantly higher for control systems, which is consistent with the existence of an output control strategy (Eisenhardt, 1985).

Additional evidence for the validity of the cluster groupings was provided in Arthur (1992) by a significant biserial correlation between two of Porter's (1980) business strategies, low cost and differentiation, and the aggregated cluster groupings ($r = .46$, $p < .05$). As predicted, mills with low-cost business strategies were more likely to have control human resource systems, and mills with differentiation strategies were more likely to have commitment human resource systems. Business strategy data for the mills were gathered independently from the data on human resource practices. This evidence of predictive validity is especially relevant for use with cluster analysis results that, in the absence of statistical tests for the "right" number of clusters, must be judged primarily on their usefulness in predicting outcomes of variables not used in the clustering procedure (cf. Aldenderfer & Blashfield, 1984).

To help determine the reliability of the categorization, I gave six raters (advanced graduate students in human resource and organizational behavior) a questionnaire that included the descriptions of control and commitment systems and asked them to judge independently whether each of the six patterns of standardized variable scores presented in Arthur (1992) represented control or commitment. The six raters unanimously selected the category used in this study for five of the six cluster patterns, and five of the six raters correctly categorized the sixth cluster. These results indicate a very high degree of interrater reliability for the human resource system categorization used in this study. In the analysis, control systems were coded 0 and commitment systems, 1.

Manufacturing performance and turnover. The respondents were also asked to report on their mills' labor efficiency, scrap rate, and turnover over the year before the survey. The variable labor hours was defined as the average number of labor hours (both direct and indirect) required to produce one ton of steel at a mill. Scrap rate was the number of tons of raw steel that had to be melted to produce one ton of finished product. Industry journals, interviews with mill managers, and pretest feedback indicated that these were common performance metrics used in the industry with which top human resource managers would be familiar. Because only human resource managers were asked to report on these measures, however, interrater reliability could not be assessed.[3]

The managers were also asked to indicate the number of production and maintenance employees who had "left the mill (either voluntarily or involuntarily) over the past year." This figure was divided by the total number of production and maintenance employees in a mill, derived from a separate question asked at the beginning of the questionnaire, to measure turnover.

Control variables. The age, size, union status, and business strategy of the mills were included as control variables. Age was the number of years a mill had been in existence (1993 minus year of founding). Data for this measure were gathered from archival sources (Hogan, 1987; International Trade Administration, 1986). It is included in the model as a proxy for the newness and sophistication of the plant design and production technology. Size was the number of employees at each mill reported by its human resource manager.

Union status and business strategy were expected to vary with the human resource system variable and to have potential direct effects on manufacturing performance. Union status data were gathered from secondary sources (e.g., Hogan, 1987); 47 percent of the minimills studied were unionized. In all but one of the unionized mills, production and maintenance employees were represented by the United Steelworkers of America.

Business strategy data were gathered through the use of a separate questionnaire completed by the top line manager at each minimill. I then cluster-analyzed these data and used them to classify the mills into low-cost and differentiation strategy categories following the work of Porter (1980) and others (e.g., Dess & Davis, 1984). Details of the business strategy variables

[3] Two studies, however, have reported performance levels for minimills measured at the industry level very similar to those found in this study and thus provide some support for the validity and reliability of the performance measures. The average productivity rate of 2.35 labor hours per ton in this study compares favorably with the average of approximately 2.00 labor hours per ton found in Hogan's (1987) survey of U.S. minimill firms. A U.S. Department of Commerce study also supports the validity of the average scrap rate of 18 percent found in this study, reporting an 80 percent "yield of raw steel to finished product" (a 20 percent scrap rate) in U.S. minimills (International Trade Administration, 1986: 12). However, given the lack of independently reported plant-level performance data with which to assess the reliability and validity of the performance measures over a specified period of time, readers may want to exercise some caution in interpreting these results.

and classifications are presented in Table 2. The strategy and union variables were coded as dichotomous variables, with 1 equaling the presence of a union and a differentiation business strategy, respectively.

Table 3 presents the means, standard deviations, and correlations for all the dependent and independent variables in the study.

RESULTS

Hypothesis 1 predicts that the presence of a commitment human resource system will be related to significantly higher manufacturing performance than the presence of a control system. I tested this hypothesis using regression analysis for labor hours and scrap rate in models that included system type and the control variables.[4] Table 4 presents results of the analyses. The negative coefficients for the human resource system variable in both models indicates that commitment is significantly related to both fewer labor hours per ton and lower scrap rates. Because the results of the overall regression model for scrap rate are not significant, however, the significance of the human resource system variable in this model must be interpreted with some caution.

The second hypothesis predicts that turnover will be higher in minimills with control systems than in those with commitment systems. Turnover was over twice as high in the former ($\bar{x}$ = .07, s.d. = .07, control, and $\bar{x}$ = .03, s.d. = .03, commitment). A *t*-test showed that this difference was statistically significant ($t = 2.19$, $p < .05$).

Finally, Hypothesis 3 states that the negative relationship between turnover and manufacturing performance will be higher in commitment human resource systems than in control systems. Table 5 presents the results of a moderated regression analysis that included the main effects of turnover and system and their multiplicative interaction. Union status was used as a control variable in this analysis because previous research has found that unionization is related to both turnover level and manufacturing performance (e.g., Freeman & Medoff, 1984). The interaction term is significant for both labor hours and scrap rate, and its inclusion results in a significant change in R^2.

Table 6 shows results of a comparison of the sizes of the correlations between turnover and performance in the two types of system, with union status again controlled. This subgroup comparison was appropriate for testing the strength of the moderating effect of system type (Arnold, 1982). The table shows significant, positive correlations between turnover and both labor hours and scrap rate for minimills with commitment systems—manufacturing performance is worse the higher the turnover. For mills with control systems, the correlations are negative and insignificant. Results of

[4] Missing data reduced the number of usable observations by three in the labor hours equation and by six in the scrap rate equation. The mills with missing data were not statistically different from the rest of those studied in age, size, or union status.

TABLE 2
Description of Business Strategy Variables and Comparison of Means[a]

Variables		Low-Cost Producer		Differentiator			
Name	Description	Means	s.d.	Means	s.d.	t	α
Low-cost producer	Provide customers with basic steel products at prices below those of competitors.[b]	4.67	1.11	3.68	1.70	2.00*	
Differentiator	Provide customers with specialized sizes, shapes, or grades of steel; develop and produce new steel shapes, sizes, or grades; switch quickly between the production of different shapes, sizes, or grades to respond to fluctuations in market demand; produce shapes, sizes, and grades for the higher-priced segment of steel market; develop new techniques and methods to market products.[b]	3.23	1.00	4.64	0.79	4.94***	.800
Focus	Serve needs of customers within a specific geographic area; create recognition of company's name and reputation in the industry.[b]	4.60	1.37	4.64	0.94	0.16	.681
Product types	Number of different product types produced	1.64	0.74	2.79	1.53	3.10**	
Product sizes	Number of different sizes of steel products produced	50.54	69.30	176.80	176.23	2.88**	
Product grades	Number of different grades of steel products produced	9.07	8.34	97.50	112.86	3.50**	
Contract customers	Percentage of 1987–88 production delivered to contract customers	17.69	18.33	27.29	28.01	1.11	
Open market customers	Percentage of 1987–88 production sold on the open, spot, market	25.38	32.30	33.54	28.15	0.80	

[a] Data are from Arthur (1992). $N = 15$, low-cost producer; $N = 25$, differentiator.
[b] Respondents were asked to indicate importance, with 1 = unimportant, 6 = very important.
* $p < .05$
** $p < .01$
*** $p < .001$

TABLE 3
Means, Standard Deviations, and Correlations

Variables	N	Means	s.d.	1	2	3	4	5	6	7
1. Human resource system	30	0.47	0.51							
2. Business strategy	29	0.69	0.47	.46*						
3. Age	29	20.44	20.01	.06	.14					
4. Unionization	30	0.47	0.51	.27	.35	.38*				
5. Size	30	463.40	318.30	.45*	.24	.36	.39*			
6. Labor hours	28	2.30	0.98	−.13	.07	−.65***	.43*	.52**		
7. Scrap rate	25	0.22	0.22	.14	−.08	−.22	.20	.66***	.50*	
8. Turnover	29	0.05	0.06	−.37	−.27	−.10	−.26	−.07	.08	.16

* $p < .05$
** $p < .01$
*** $p < .001$

TABLE 4
Results of Regression Analysis, Systems on Performance

Variables	Labor Hours b	Labor Hours s.e.	Scrap Rate b	Scrap Rate s.e.
Constant	1.46***	0.28	0.12*	0.05
Age	2.23**	0.67	−0.24*	0.11
Size	0.08	0.06	0.02	0.01
Unionization	0.27	0.32	0.08	0.05
Business strategy	0.17	0.33	0.03	0.05
Human resource system	−0.79*	0.36	−0.14*	0.06
R^2	0.65		0.42	
df	5, 21		5, 18	
F	6.25**		1.85	

* $p < .05$
** $p < .01$
*** $p < .001$

tests of the difference between the correlations using Fisher's Z transformation were significant for both labor hours and scrap rate.

DISCUSSION

The regression results in this study indicate that the human resource system taxonomy developed in my previous research (Arthur, 1992) was significantly associated with variation in steel minimills' performance. More specifically, these results support observations made by Walton (1985) and

TABLE 5
Results of Regression Analysis, Turnover and Human Resource Systems on Performance

	Labor Hours				Scrap Rate			
	Restricted Model		Full Model		Restricted Model		Full Model	
Variables	b	s.e.	b	s.e.	b	s.e.	b	s.e.
Constant	2.34***	0.36	2.56***	0.31	1.13***	0.05	1.16***	0.05
Unionization	0.95*	0.36	0.74*	0.33	0.08	0.05	0.06	0.05
Turnover	1.74	3.06	−0.90	2.90	0.24	0.43	−0.08	0.41
Human resource system	−0.28	0.38	−1.18*	0.48	−0.01	0.06	−0.14†	0.07
Turnover × system			25.22*	9.43			2.99*	1.30
R^2	0.25		0.43		0.12		0.30	
df	3,23		4,22		3,21		4,20	
F	2.51†		4.17*		0.92		2.16	
ΔR^2			0.18				0.18	
F			6.92***				5.14**	

† $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$

TABLE 6
Comparisons of Partial Correlations

	Control		Commitment		
Variables	*r*	*N*	*r*	*N*	Z^a
Labor hours	−.046	16	.830**	11	1.95*
Scrap rate	−.057	15	.900***	10	2.01*

[a] One-tailed tests.
* $p < .05$
** $p < .01$
*** $p < .001$

others concerning the effectiveness of commitment-type human resource systems, at least in the context of manufacturing plants using technologically intensive and relatively integrated continuous production processes (e.g., Dean & Snell, 1991). Interestingly, no tradeoff between production quality and efficiency emerged. Commitment was associated with both lower scrap rates and higher labor efficiency than control.

In addition, the significant differences found between the two types of systems in both turnover and the relationship between turnover and manufacturing performance suggest the importance of including a measure of human resource system as a moderator in future research on the consequences of turnover. These results support the recent observations of a number of researchers who have noted the importance of identifying organization-level consequences of employee turnover (e.g., Dalton & Todor, 1979; Mobley, 1982; Schwab, 1991).

Finally, the lack of a significant correlation between turnover and manufacturing performance in control systems may indicate a nonlinear relationship between these two variables. In other words, organizations with control human resource systems may benefit from high employee turnover up to some point, but after that point is reached there begins to be a detrimental effect on manufacturing performance. In contrast, the results show a negative linear relationship between turnover and manufacturing performance in the commitment systems. The finding that the right amount of turnover varies with system type has important implications for practitioners seeking to manage this process.

Limitations and Future Research

The relatively small number of existing minimills limited the types of statistical analyses possible, including the use of a full set of control variables in testing Hypotheses 2 and 3. In addition, the specific characteristics of the organizations studied limit the generalizability of these results. To what extent do the human resource systems found in this study also exist in large public sector organizations such as schools and hospitals? What is the relationship between human resource system and organizational performance in less technologically intensive, service-oriented organizations? Final evaluation of the evidence for the human resource strategy perspective will need to await the accumulation of results from studies conducted in multiple industry contexts.

In addition, although the findings of this study are consistent with a conceptual model in which the choice of human resource system leads to changes in manufacturing performance, the cross-sectional data used here did not permit any tests of the causal ordering between effects of system and performance. It is possible that better performing mills also have additional resources that facilitate management's choosing commitment systems.

Further, research progress on the human resource strategy perspective depends critically on the development of conceptually and methodologically sound measures of the human resource system construct. Although the taxonomy used in this study shows some conceptual and predictive promise, much more work needs to be done concerning definition and measurement of the dimensions of human resource systems. A key related issue is the performance implications of mixed systems. A premise of this work is that control and commitment represent conceptually distinct ideal systems and that any deviation from the ideal types will weaken performance. Alternatively, control and commitment can be conceptualized as the opposite ends of a continuum of possible human resource systems and the most effective system seen as existing somewhere between the two extremes.[5] Empirical tests are needed to determine which conceptualization more accurately describes the construct.

Other parts of the human resource strategy model are also in need of empirical investigation. For example, because of sample size limitations, I was unable in this study to test for the performance effects of the fit between business strategy and human resource strategy. Finally, there is a need to demonstrate that certain combinations of human resource programs, policies, and practices lead to specific employee attitudes, such as trust in management or organizational commitment, that in turn lead to specific employee behaviors beneficial to effectively implementing a given business strategy. Exploring these intermediate links explicitly will undoubtedly lead to further refinements and insights into the process by which combinations of human resource activities can lead to competitive advantages for firms (e.g., Cappelli & Singh, 1992).

Conclusions

In spite of its limitations, this research shows that a number of insights can be gained through the use of a human resource strategy perspective and methodology. By empirically testing whether certain combinations of activities are associated with higher manufacturing performance, this study provides one of the first pieces of empirical evidence with which to evaluate the prescriptions in the human resource strategy literature. Many authors have

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[5] I would like to thank an anonymous reviewer for drawing my attention to this point.

called for such evidence (Dobbins et al., 1991; Fisher, 1989; Jackson et al., 1989; Lengnick-Hall & Lengnick-Hall, 1988; Snell & Dean, 1992; Wright & McMahan, 1992). In addition, the study has shown that identification of human resource systems promises to add significantly to understanding the relationship between turnover and organizational performance. Although these results should be seen as preliminary because of data limitations, this study provides future researchers with some empirical evidence supporting a promising new perspective with which to study important human resource and organizational outcomes.

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